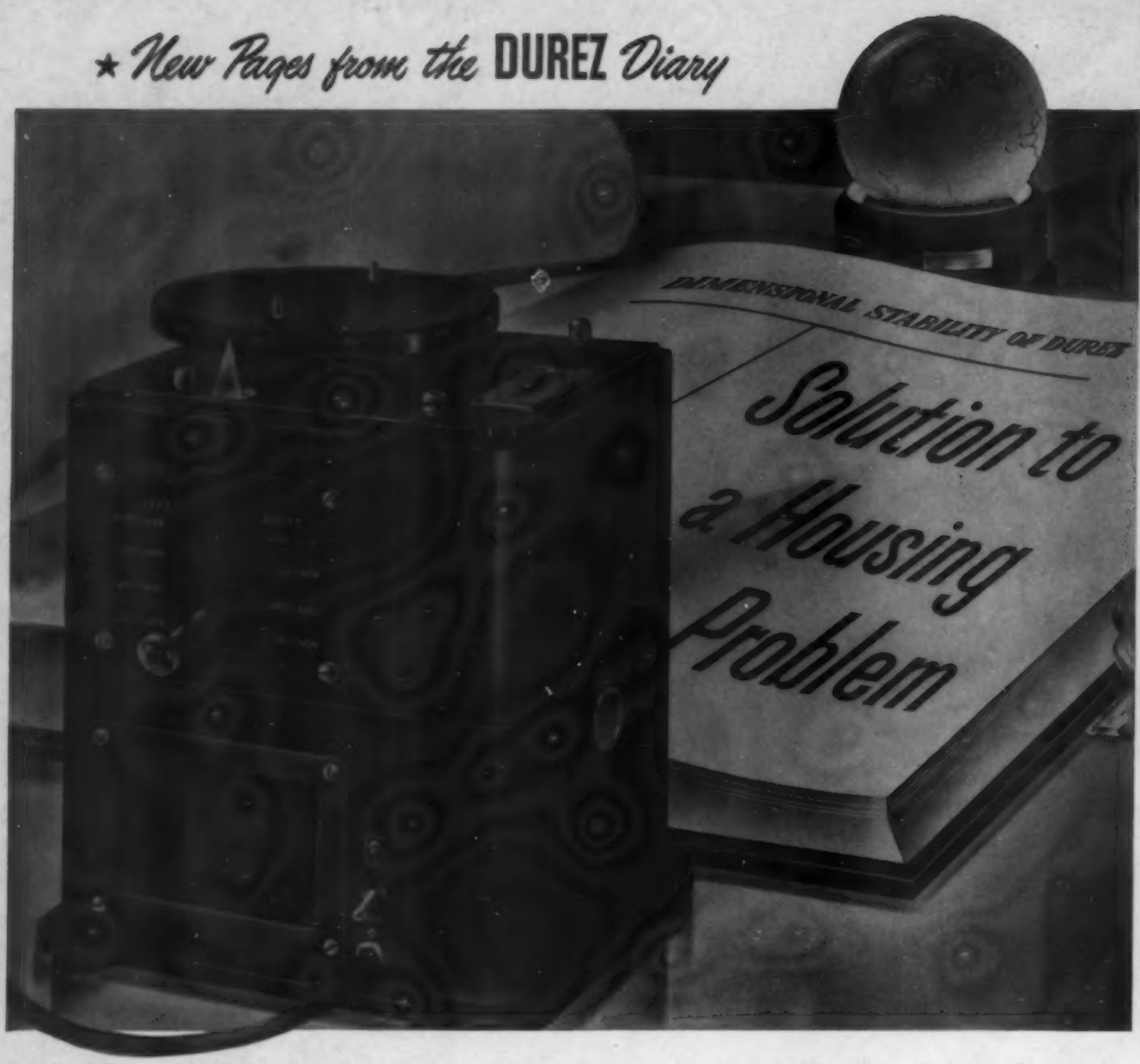
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MODERN PLASTICS



APRIL 1947

★ *New Pages from the* **DUREZ** *Diary*

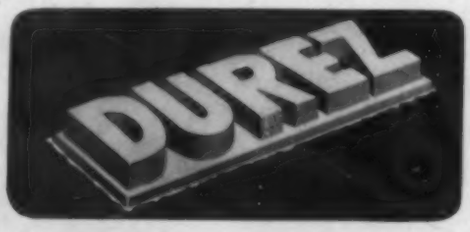


In Africa's heat and Alaska's cold, in the dryness of the desert and the wetness of the monsoons, this aircraft instrument tester must test *right* and it does... to within one-half second in 1080 degrees... three full turns of the turntable.

High dimensional stability, which affords a very rigid setup, and good flow and finish, are properties that dictated the use of a Durez black phenolic molding compound for the housing and the turntable. Because of its extremely low shrinkage and expansion, Durez solved three major problems... the mold design for the housing, surface "flatness" on the turntable, and accurate marking of the turntable scale.

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- MOLDING COMPOUNDS
- INDUSTRIAL RESINS
- PROTECTIVE COATING RESINS

PHENOLIC PLASTICS THAT FIT THE JOB



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Catalin cast phenolics in any of their forms—transparent, translucent or opaque—are ideally suited to a variety of decorative uses. Catalin has an unrivalled aura of luxury and charm, whether its distinguished characteristics be adapted to hair brushes or book-ends, clocks, radios, desk and table pieces and many other product applications. To all, Catalin brings a rich interpretation of color in its most appealing sense.

Catalin's highly developed casting techniques have brought a new flexibility to product design planning. Catalin castings produced in straight-draw, split or core molds provide complicated and unusual shapes without expensive custom mold costs.

For the touch of beauty that will add new sales appeal to your next product application, look to Catalin. Our service staff will welcome the chance to assist you. Inquiries invited!

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CAST RESINS • LIQUID RESINS • MOLDING COMPOUNDS

MODERN PLASTICS

VOLUME 24 APRIL 1947 NUMBER 8

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"EXECUTIVE and EDITORIAL OFFICE: 122 E. 42nd St., New York 17, N. Y. Published every month by Modern Plastics, Inc., at Publication Office: Twentieth and Northampton Sts., Easton, Pa. Entered as second class matter, May 28, 1940, at the Post Office at Easton, Pa., under the act of March 3, 1879." Copyright 1947 by Modern Plastics, Inc. All rights reserved. Subscription $5.00 a year, $8.00 for two years in U. S., its possessions and South America. Canadian subscriptions $5.50 per year. All other countries $6.00 per year, payable in New York funds.

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Flammability Laws

Stimulated by an editorial in the Sacramento, California News-Bee, the California legislature enacted a law two years ago to regulate traffic in dangerously flammable materials. Similar bills have now been introduced in the national Senate and House of Representatives at Washington, D. C. According to the National Retail Dry Goods Association, 23 states are contemplating introduction of "flammability" bills.

Members of the plastics industry certainly endorse the general idea of a law that would forbid the distribution of highly flammable wearing apparel, but are concerned and confused over the introduction of plastics into the issue. Plastics films, sheets and small molded pieces are generally slow burning in comparison to many other materials; some are flame resistant. Even cellulose nitrate, considered the fastest burning of all plastics, has frequently passed the burning tests recommended in the Arnold bill when it has been used as a coating for fabric.

The only House bill naming plastics is H. R. 1111 (the Arnold bill). The intent of the framers of the bill is laudable enough but the practicality of enforcing it as presently written is open to question. The cotton textile interests are virtually unanimous in reporting that chemical treating for flame retardance is not yet commercially feasible on a large scale and that the testing methods provided in the terms of the bill will not provide a universal standard. More details are given on pages 182 through 185 of this issue, where the hearings before the Congressional Committee are reported.

Members of the S.P.I. committee on plastics film are on guard over this legislation to prevent a witch hunt—the singling out of plastics as a proscribed material and consequent discriminatory legislation. The purpose of the committee's proposed amendments to the Arnold bill is to set up flammability standards which can be applied to plastics fairly, without prejudice from officials or other persons involved in the testing procedure.

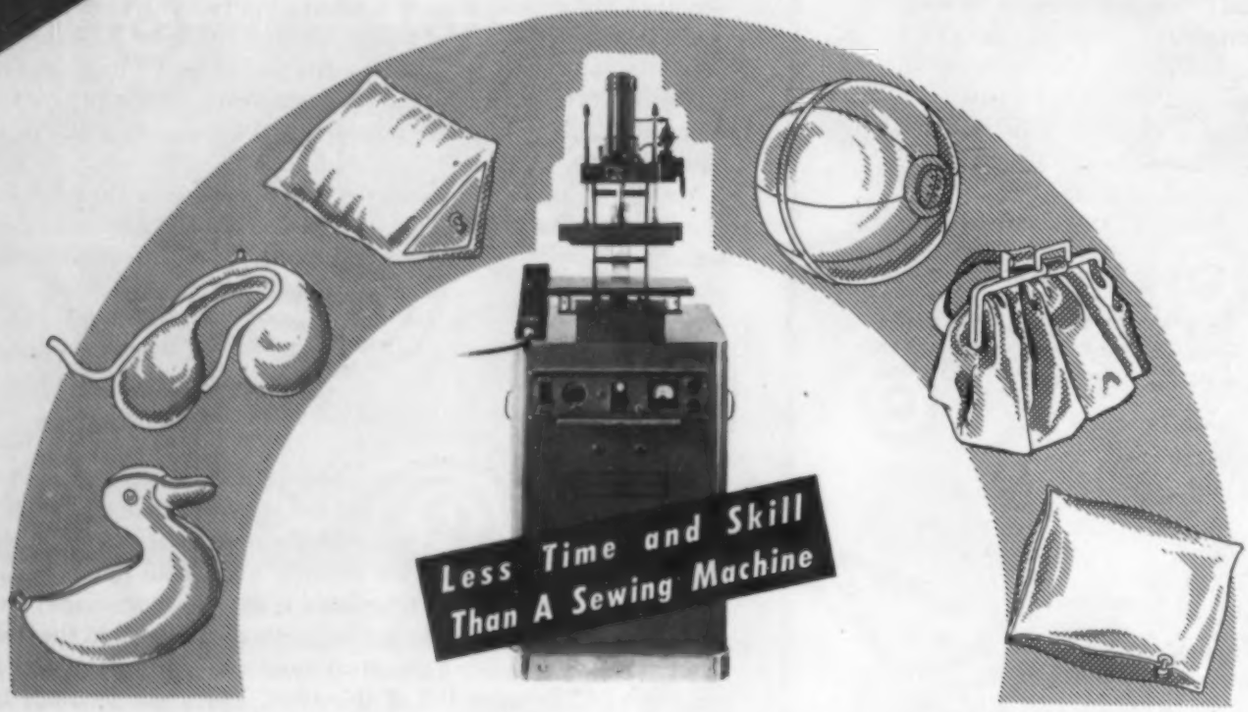
The flammability question is only one of many confusing situations concerning plastics with which the general public is confronted. Particularly noticeable at the Washington hearings was the eager curiosity which Congressmen evinced over plastics; but equally evident was their perplexity concerning its manufacturing processes and physical properties. It is difficult for the public and Congressmen alike to understand that cellulose nitrate and urea buttons are as different as iron and aluminum; that cellulose acetate and polystyrene are as unlike as oak and pine; that Saran and nylon are as far apart as cotton and wool; that the classification of "plastics" includes a family of materials with different properties just as "metals" includes another family with members of varied characteristics.

Only a broad scale educational program will do the job. How to do it could well become the first order of business for all those interested in plastics progress.

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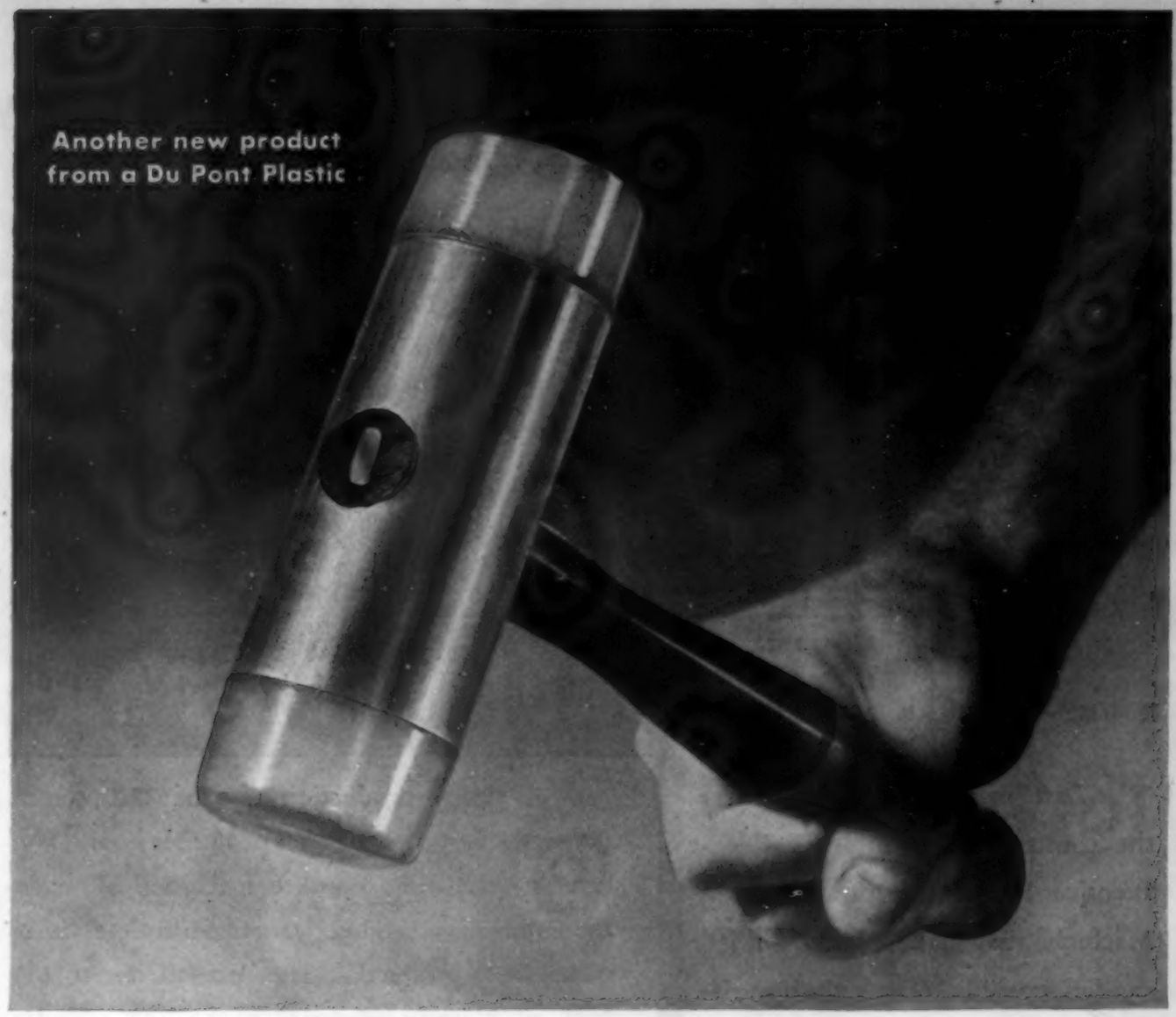
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These results, added to his knowledge of the proved qualities of nylon, so impressed this manufacturer that he chose nylon as the facing for the new and better hammer you see above.

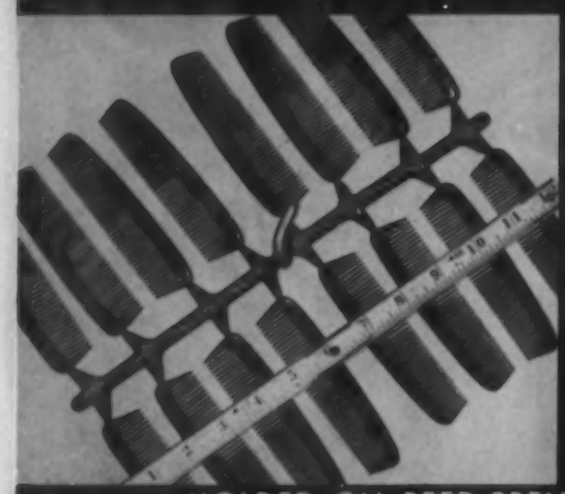
Nylon has several important advantages over the material formerly used. It is dimensionally stable, and the face of the hammer does not work loose from the ferrule in which it is seated. Nylon does not mushroom, chip or become "doughy" from internal friction. It gives an effective blow without bouncing or marring the work. It resists industrial oils and is attractive in appearance.

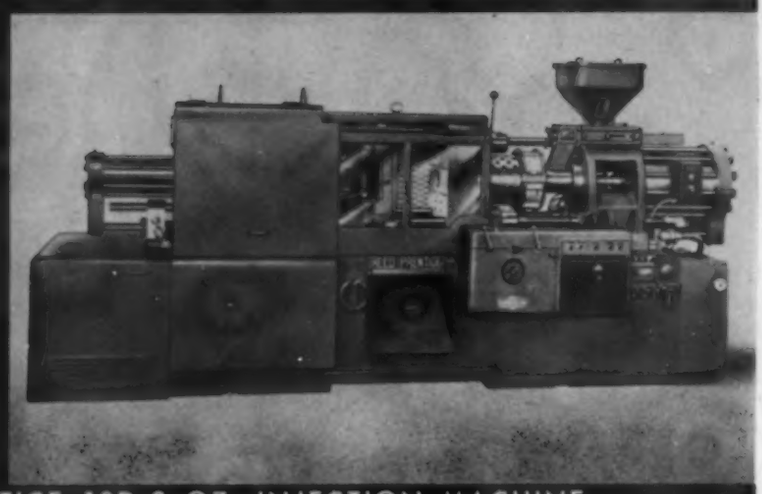
Perhaps your product could be improved if you knew the facts about nylon or the entire family of Du Pont plastics. Write for literature today. E. I. du Pont de Nemours & Co. (Inc.), Plastics Department, Room 364, Arlington, N. J.

Nylon-faced hammer made by The Danielson Mfg. Co., Danielson, Conn., to be sold under the trade name "Danco-Nylon Hammer."

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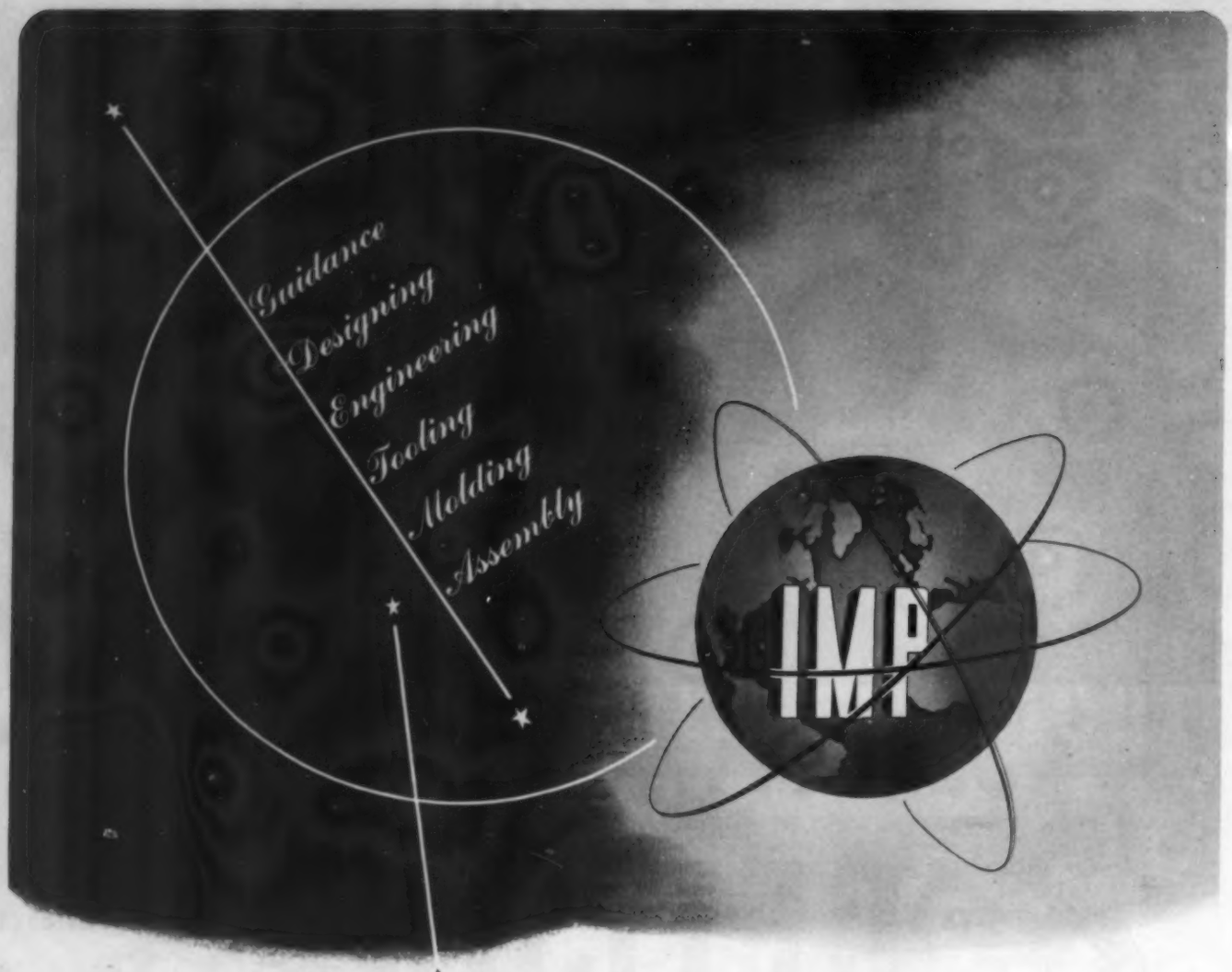
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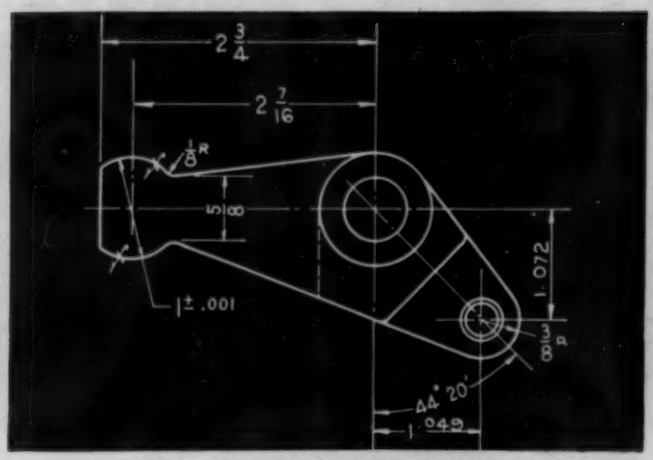
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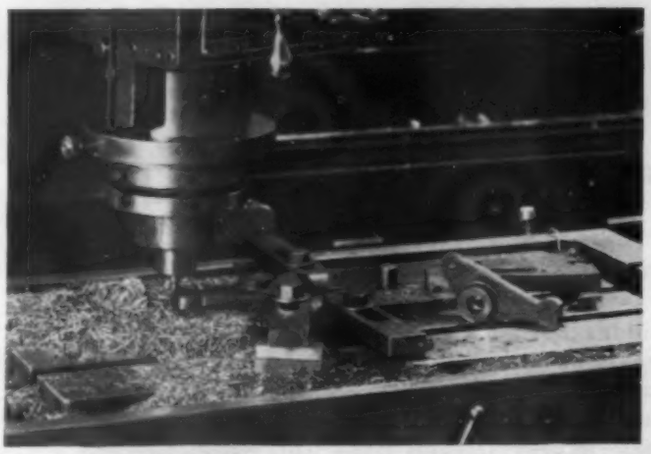
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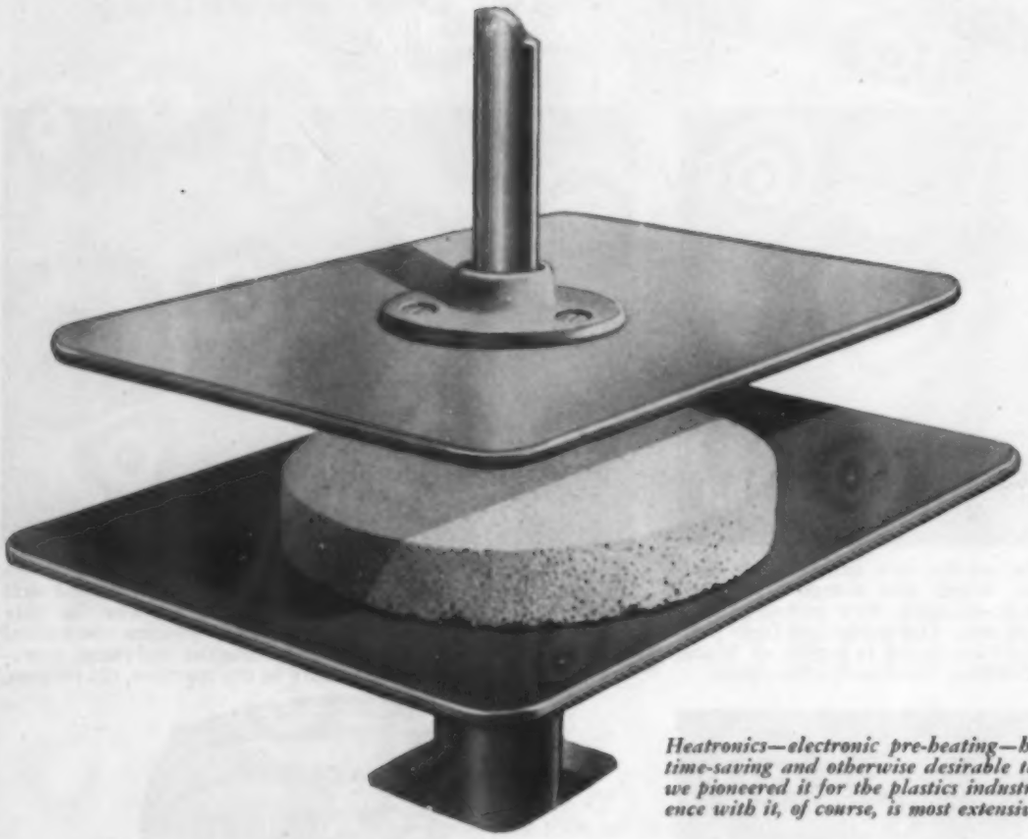


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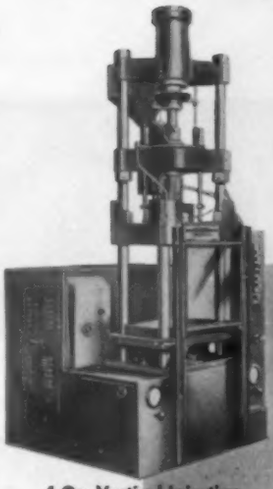


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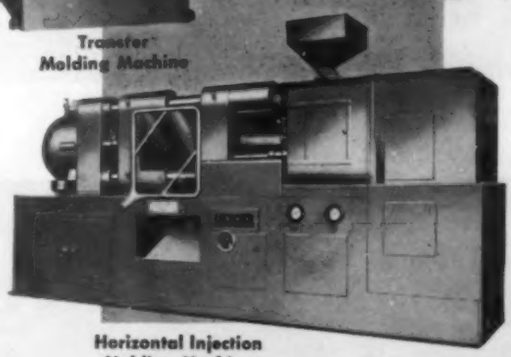
Compression Molding Machine



Transfer Molding Machine



Tableting Press



Horizontal Injection Molding Machine

Only Watson-Stillman makes a *complete, standard line* of hydraulic plastic molding equipment. Only Watson-Stillman can offer you *standard* equipment that can meet your every need, no matter what process—no matter what plastic material you want to use!

Reflected in every unit in this complete line is Watson-Stillman's 99 years of experience in the building of hydraulic machines. All W-S molding equipment combines production speed and efficiency, ease of operation and maintenance — *plus* the cost advantages of standard design. The Watson-Stillman line of standard plastics equipment includes

• Vertical Injection Molding Machines—1 to 4 ounces • Compression Molding Presses—50 to 1200 Tons • Transfer Molding Machines—50 to 1200 Tons • Preform Tableting Machine—100 Tons • Horizontal Injection Molding Machines—8 to 80 ounces • General Purpose Presses—20 to 200 Tons.

Don't hesitate to ask for Watson-Stillman's advice on selecting equipment or for W-S help in solving any plastic molding problem. There is never any obligation. Write or call The Watson-Stillman Co., Roselle, N. J.

2499

WATSON-STILLMAN

HYDRAULIC MACHINERY DIVISION

Established 1848

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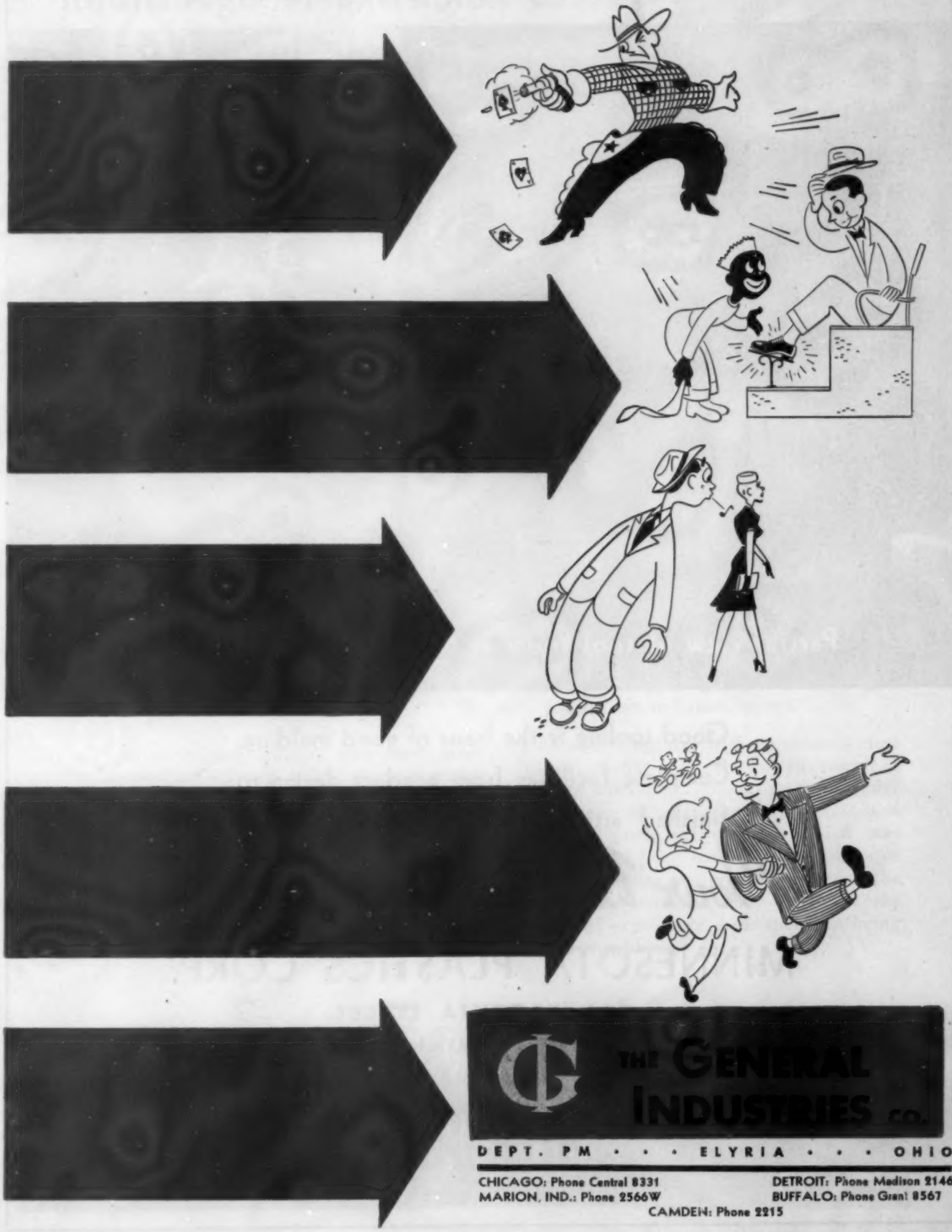
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Plastics
MACHINERY DIVISION

New PLASTICS BANBURY FOR HIGH PRODUCTION



Here's the No. 11 Banbury mixer designed specifically for large-scale mixing of plastics stocks.

It has a chamber capacity of 14,940 cubic inches—three times the capacity of the 3A, and more than twelve times that of the 1A, the two sizes now in general use for processing plastics. The No. 11 has all the design and control features which have enabled the smaller sizes to handle efficiently such a wide variety of plastics.

The design features include: Extended feeding neck with water-cooled section near the hopper; hopper entirely chrome-plated to prevent contamination of stock; step-up discharge door to prevent leakage of materials from mixing chamber during operation; and rotors with force-feed lubricated dust stops.

Cored chamber sides and cored rotors fitted with stuffing boxes allow application of coolant or steam. Potentiometer pyrometer with thermocouple in contact with batch gives chart recording of each operating procedure. Telechron timing device fitted with instruction charts signals operator as each step of mixing cycle is completed.

Complete information on the No. 11 plastics Banbury or on any of the equipment listed on this page is yours for the asking. FB-381

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- Pelletizers
- Mixing, Grinding Warming and Sheeting Mills
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Children are smart people. With the aid of educational playthings like this Peg-O-Lite, they learn at an early age to recognize the shape of things as they are—none of this square peg in round hole business for them!

Selecting a molder whose ability shapes up to your production needs is a lot like working the Peg-O-Lite. Your molder should shape his skill to fit your particular production problem. Product design—mold design—selection of the correct plastic material—most effective use of the right molding technique all are important factors to consider. That is where Elmer E. Mills Corporation engineers can help you. We do not attempt a job unless our particular injection molding and extrusion techniques shape up exactly to your product's objective.

When we do mold a product you can be sure the light of increased sales appeal shines brightly upon it. Consult us without obligation.

Peg-O-Lite, molded for Allen Products Co., Chicago

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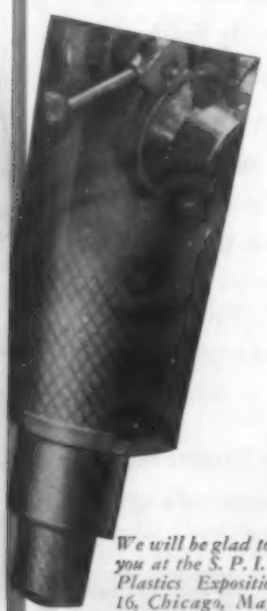
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We will be glad to welcome you at the S. P. I. National Plastics Exposition, Booth 16, Chicago, May 6 to 10.

INSUROK *Precision Plastics*



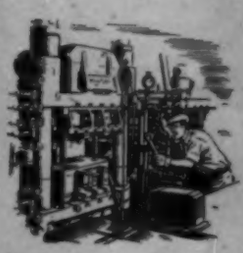
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Use Multiple Hobbed Cavities By Midland





This thermostat control housing is a typical sample of the care and precision Midland exercises in producing all hobbed cavities. Note particularly the small, perfectly shaped raised letters and numbers, the attention to detail, and the smooth contours. The hob is capable of repeated use in making innumerable cavities at exceptionally low cost.

If you're still turning customers away because you can't turn out enough and are thinking of new molds to step-up production, then think in terms of reducing costs with uniform, accurate, perfectly finished multiple hobbed cavities made by the Midland method. You'll get greater mold capacity at a whisker of what it costs to duplicate cavities by machining. The example at left shows how precisely intricate details and extreme depth are handled by Midland.

Midland delivers perfect hobbed cavity molds for injection or compression molding usually faster than a cat can have kittens.

So write today for your copy of "Shaping Tomorrow Today" the book that describes Midland organization, experience and facilities.

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When Mold Steels Give . . .



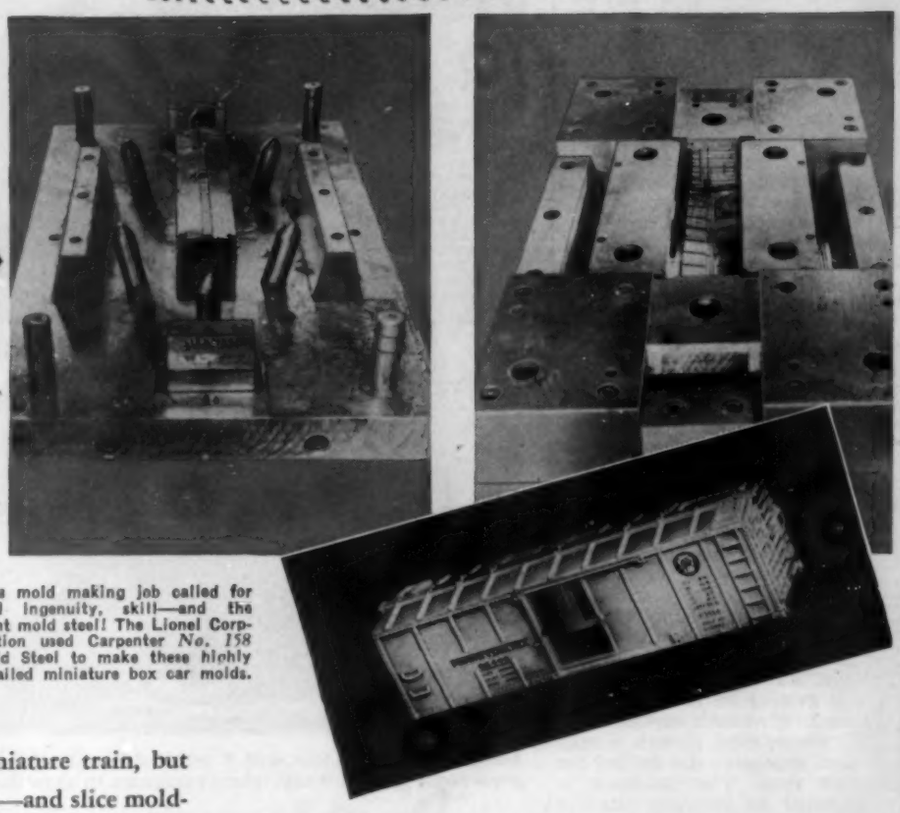
MAXIMUM STRENGTH

MIRROR FINISHES

LONG PRODUCTION RUNS

EXTRA WEAR RESISTANCE

UNIFORM HARDNESS



This mold making job called for real ingenuity, skill—and the right mold steel! The Lionel Corporation used Carpenter *No. 158* Mold Steel to make these highly detailed miniature box car molds.

● It's child's play to run a plastic miniature train, but it's a man-sized job to make these molds—and slice molding costs, too! For example, unusually high strength was needed to eliminate breakage on thin sections. Freedom from distortion, hardening accuracy, cleanness and uniformity were all part of the specifications. Then too, extra wear resistance was needed to carry the molds through long, punishing runs. Carpenter *No. 158* Mold Steel not only met these "specs"—but made possible a perfect finish on every unit turned out!

Top-notch mold results like these aren't "accidents". They're the sum total of sound design, mold making skill —and the right mold steel. So get in touch with your Carpenter representative today. If your problem is one of selection, machining, hobbing or heat treating, he can help you—with printed information or personal suggestions. Just call your nearest Carpenter Warehouse, now.

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AUBURN Plastics Reporter

Auburn Button Works, Auburn, N. Y.

MOLD MARK

Profitable Tips to Purchasing Agents

Close tolerances cost money—even in plastics! Your engineering department wants interchangeability, uniformity and nice fits. We have "fits," too, sometimes. Example: The print shows plus .001" minus .001", yet the component metal mate runs plus .005" minus .002". So what? So mold costs move up and parts cost more. Rejects are higher and gauging operations have to be set up when all the time a good mold and good molding technique would produce satisfactory parts at no premium price.

To Our Customers

Basic shortages of chemical ingredients continue to plague the plastics industry. Some materials which were in short supply last year are now abundantly available—the styrenes, acetates and ethyl cellulose.

The phenolic compounds, however, oldest of all thermosetting resins, are critically inadequate. The suppliers are forced to allocate their production on a month-to-month basis. Auburn is satisfied that it is getting its share. Auburn tries to give each customer his fair share, even though it may mean expensive die setting for short runs. The condition is expected to improve later in the year to an extent that would justify ordering molds now for



George H. Johnson, Purchasing Agent, spends most of his time getting material.

phenolic items on which immediate production will not be required. Tool deliveries are running eight to twenty weeks, depending on the complexity and extent of the tooling.

As soon as plants for producing basic chemicals can be rushed to completion, the flood gates can be opened and Mr. Johnson can get off the phone.

Auburn Know-How Began Here!



Auburn know-how was only 8 years old in this 1884 picture. It shows the Auburn Button Works press room gang. It would take a panorama to show the present gang—*and no children included!*

In those early days difficulties were many and vexing. Today's problems are simple compared with 19th century problems of molding of shellac composition. Then the slightest roughness or undercut would so stick up a die that the lower and upper molds had to be forced apart by hammer and chisel. Finally the impressions had to be cleaned and repolished.

A later development in plastics was a chemical compound of phenol and formaldehyde. Much molding experience was necessary to get a powder from this material that would mold properly. The Auburn Button Works conducted numerous experiments and testing of materials which ultimately proved useful in developing a product that could be used as a satisfactory general utility material.

Auburn pioneered also in the manufacture of pyroxylin which, with other materials, gradually superseded shellac composition for many uses.

Another Auburn pioneering accomplishment was the molding of plastic parts for the electrical industry. In this work, never before attempted, Auburn cemented its reputation as a trail blazer. Still another Auburn first was the development of "re-use" packages—containers which, after serving their original purpose, are convertible into cigarette boxes, powder cases, etc.

All these developments were the result of countless experiments plus a liberal dash of the pioneering spirit. But each has bequeathed its hard-earned knowledge to the molders of today. Skill in mold design, mold making and the actual molding itself, rapid assembly of molded parts, production-line finishing, the vital engineering know-how necessary to keep molding costs down—these were born of long and hard experience.

'Plastics Makes Perfect'



Handles for Kitchen Tools
(Turner and Seymour)

Lesson:
Wood is good,
But 'Poly' is jolly.

What do You Want

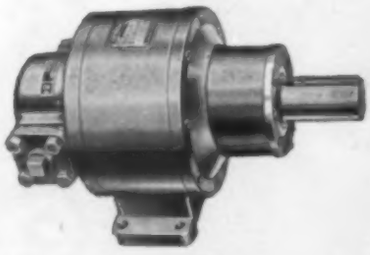
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THE NEW 75-TON MULTIPRESS for PLASTIC PREFORMING



IN ONE PRESS — manual or automatic "work-fit" control of every essential press-cycle

NEVER BEFORE has a press of this size featured such a wide range of ram actions and controls. Offering a choice of three valve combinations, it will meet practically every pressing-cycle need within a 75-ton range.

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If you use or need press equipment for any type of operation in the 75-ton range, you'll want full details on the many advantages of this highly versatile new MULTIPRESS. Write for bulletin DS-7.

**An exclusive* MULTIPRESS *development, providing short, uniform, repeat pressure strokes on the work with each downstroke of the ram.*

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Check your molder today . . . or write for full Lustron details: MONSANTO CHEMICAL COMPANY, Plastics Division, Springfield 2, Mass. In Canada, Monsanto Ltd., Montreal; Toronto; Vancouver.
Does your production superintendent or your design engineer know there will be 80 million lbs. of Monsanto Lustron styrene in '47?
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SERVING INDUSTRY . . . WHICH SERVES MANKIND

THEY SAID IT COULDN'T BE DONE!



We said it could. From our more than 20 years experience with plastics, we knew we could turn out this gas pump price sign — in one piece by injection molding, and we did. Here it is—molded of polystyrene weighing 10 oz., dimensions 8¾" x 6½" with wall thickness ⅛". Space between the walls is ¾" to allow for booklet carrying prices to be inserted. Core was extracted automatically in order to accomplish exact synchronization with the mold. The result is a crystal clear display sign, and an item which is proving to be a boon to gasoline dealers looking for the perfect pump price sign.

We won't say this wasn't a tough job. It was. It required all the ingenuity and plastics "know how" we possessed. This same experience in handling tough injection molding problems is yours for the asking. Remember, we are equipped with 15 Reed-Prentice injection presses. We have a capable engineering staff ready to tackle your custom molding problems, plus the desire to serve you promptly, efficiently and economically.

A. J. DESIMONE *Corporation*

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Manufacturing horizons unlimited!
RESPROID is a modern wonder plastic. It includes unsupported films and plastic coatings for draperies, luggage, upholstery, shower curtains, food covers, as well as extruded shapes — opportunities as limitless as your own imagination.
RESPROID comes in a wide range of styles . . . from transparent to opaque . . . from paper-thin calendered films, printed or plain, to heavy films embossed with leather grains. It comes in a rainbow of jewel-like colors and pastel shades. It is waterproof, acid and alkaline resistant, insoluble in most greases and oils. It is unusually easy to handle. You can either stitch or heat-weld it.
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THE MIRACLE MATERIAL

NOW A MOLDMAKER'S TOOLROOM LATHE WITH A PLUS FOR PLASTICS MOLDMAKERS



A complete range of lead variations—you can set your machine for any one of them in exactly one and one-half minutes!

Compare that performance with a normal toolroom lathe's—and change gears requiring thirty minutes to change. Think what you'll save on production time—and on original investment in change gears, too—especially if any sizable share of your production is thread molds for plastics.

Principal among the patented features of this new Monarch moldmaker's toolroom lathe is the adjustable leadscrew variating mechanism—a device that makes it a simple matter to compensate for the shrinkage of the material to be molded. Plastic thread molds become a mere routine production operation.

Then there's a speed-reducer—that permits slowing down to a *fraction of a revolution a minute* for internal and external milling operations, performed at a single setting of the mold in the lathe.

Add to these the features built into every Monarch toolroom lathe (and the machine is equally adaptable for normal toolroom work)—features that have a proved record for precision and long life. The result is a machine you can't afford to be without if you have any plastics production. Like more facts? Ask for specification sheet 405—or call your nearest Monarch representative.

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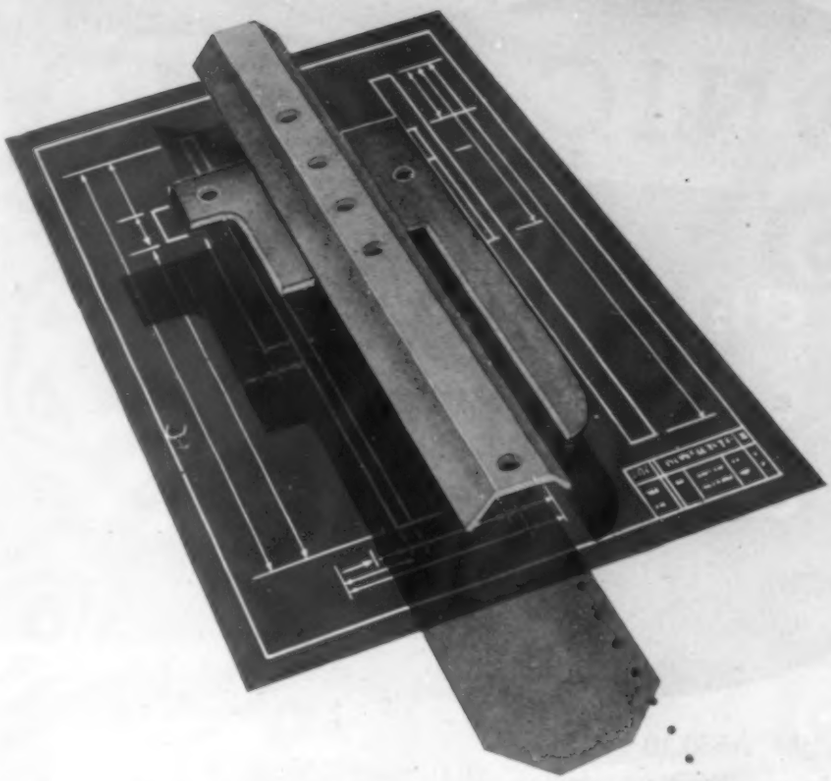




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A principal aid in plastics development is the Carver Laboratory Press. This small, powerful press is just what every laboratory needs for research and development work. Standard Accessories include Electric or Steam Hot Plates, Carver Test Cylinders, Swivel Bearing Plates, Cage Equipment, etc. This equipment has long been accepted as standard for making quick, accurate small-scale tests; for development, research and instruction work; testing single cavity molds; preparation of samples, and even for small scale production. Accurately controlled pressures to 20,000 lbs. Self-contained hydraulic unit, with 6" gauge rigidly mounted on base. Special gauges available for low pressure work. Write for catalog.

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EXTRUDING Plastex offers complete tool room and production facilities for extruding all thermoplastic materials to meet your most exacting specifications for size and finish.

FABRICATING The most modern automatic equipment is used by Plastex in the mass production of laminated plastic parts to meet the special requirements of each individual industry.





ASSEMBLING Experienced workers assure fast and accurate assembly of completed products or units. The central location of Plastex makes this service especially economical.

Plastex engineering and tool shop facilities are immediately available for consultation and development service. Contact Plastex today.

PLASTEX

THE PLASTEX CORP. • COLUMBUS 3, OHIO

ITACONIC ACID



Molecular Weight	130.10
Appearance	White, crystalline, solid
Melting Point	167-168°C.
Solubility in Water	At 20°C. a saturated solution contains 7.6 grams of Itaconic Acid per 100 grams of solution.

This unsaturated dibasic acid, now available in research quantities, offers many possibilities as a raw material in the field of chemical industry.

It can be used as a raw material in the preparation of resins of various types.

Its esters can be polymerized to yield colorless, transparent plastics of varying characteristics, depending on the alcohol with which the acid is combined. They can also be co-polymerized with other monomers, opening a wide range of possibilities.

Its structure indicates that it might prove a useful raw material for the preparation of wetting agents.

It can be converted to citraconic or mesaconic acid and forms an anhydride.

Reduction yields methyl succinic acid which, in turn offers other possibilities as a raw material.

Itaconic Acid is not yet being prepared in commercial quantities, but limited amounts are available for laboratory research.

For samples and further information, please inquire of Chas. Pfizer & Co., Inc., 81 Maiden Lane, New York 7, N. Y.; 444 West Grand Ave., Chicago 10, Ill.; 605 Third St., San Francisco 7, Calif.

PFIZER

PFIZER QUALITY

Manufacturing Chemists Since 1849

AT THE CHICAGO SHOW *Next Month!*

All roads lead to Chicago for the Second National Plastics Exposition, May 5 to 11. Never has *"what's new"* been of greater interest to the industry. With powders now more plentiful, *efficient production* again is the No. 1 need. And there couldn't be a better place, or time, to check on equipment progress.

NEW ECONOMY

Of particular interest to molders will be the new Elmes Hydrolairs—fast, power production presses without motors or pumps that cost only about *one-fiftieth* of a penny, per average cycle, to operate. Announced at the end of last year, they're already the talk of the trade.

Molders also will want to see the *new* Elmes compression molding press which will be unveiled at the Chicago show. Adaptable for transfer molding, it combines *every* modern feature of press design—position slow-down—adjustable timer—convenient push-button panel—compact construction with integral power unit—flush knockouts with lower reset by foot treadle.

PRESSES, PUMPS, ACCUMULATORS

Other features of the exhibit include an Elmes 1000-ton hobbing press—with new pumping unit—for the making of accurate molds, and an animated explanation of how the Elmes pump-accumulator system supplies dependable, limitless, *cushioned* power for group-press operation.

You are invited to make Booth No. 407 your headquarters.

BE SURE TO SEE

- The New Elmes Hydrolairs
- The New Elmes Compression and Transfer Molding Press
- The Compact Elmes 1000-Ton Hobbing Press
- The "In Action" Explanation of How Elmes Pump-Accumulator Systems Work

ELMES

Since 1851

HYDRAULIC EQUIPMENT

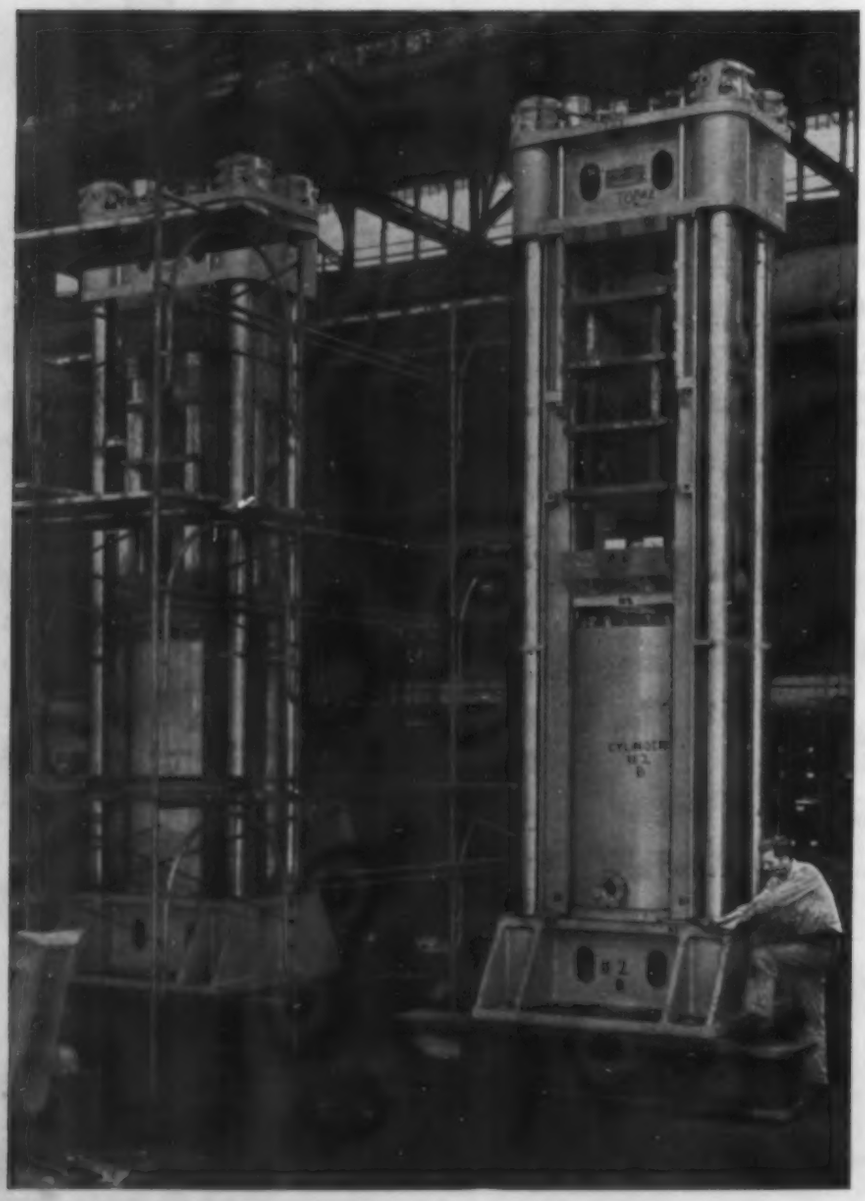
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This means that you can name the features you want —and get them.

We will furnish the unit with or without self-contained or separate hydraulic power system. Such items as pumps, accumulators, valves, intensifiers, shock-absorbers, and accessories can be included or omitted, according to your specifications.

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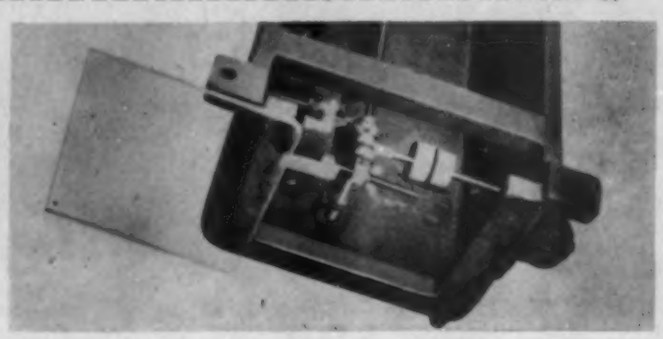
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DOW Plastics

What's new in testing—

NOW—A *CONSTANT FORCE* BENCH-MOUNTED FATIGUE MACHINE for SHEET MATERIALS





Here's another major advance in the move to substitute facts for forecasts in investigating the performance of sheet materials. The new Sontag SF-2 Fatigue Machine is small, compact, and comparatively light in weight. It discriminates between various compositions and grades of materials.

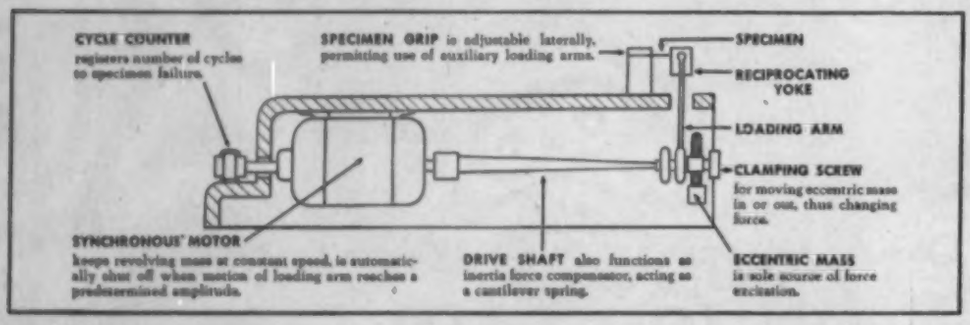
Constant *force* is applied throughout the period of test by an eccentrically mounted revolving mass. Movement is constrained so horizontal moments are absorbed, and inertia forces in the vertical plane are compensated by the drive shaft, acting as a spring.



Short (5-inch) auxiliary loading arm permits bending moments up to 100 inch-pounds to be applied.



With long (13-inch) auxiliary loading arm, bending moments can be increased to 260 inch-pounds.



With this new machine, sources of error inherent in data from constant-deflection machines are eliminated. No calibration or calculation of deflection-load ratios are required. Tests are not interrupted for recalibration; they can run day and night. No attention is needed when test is in progress; motor automatically stops at conclusion; counter shows number of cycles of flexture. ASK FOR NEW BULLETIN No. 256 giving complete data.

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IN PLASTICS AND METALS



Distributor cap of plastics and metals, nipples of Elastomeric plastic, together with distributor and spark plug wires; all precision manufactured by Auto-Lite.

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See our catalog in Sweet's File for Product Designers.

The range of products and parts where plastic and metals can be combined to decided advantage is growing rapidly . . . costs are cut . . . streamlined design becomes practical . . . color can be readily incorporated. For instance, this Auto-Lite distributor cap assures the highly important precision positioning of the metal contacts, provides a high insulation factor, gives low-cost construction . . . and even this utilitarian item shows the modern color eye appeal possible through plastics. The nipples are plastic, too, in a material which resists both ozone and oil in breakdown tests far surpassing any normal field conditions.

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SARAN BY NATIONAL denotes monofilament, rattan and tape manufactured by The National Plastic Products Company from Saran, a vinylidene chloride copolymer made by The Dow Chemical Company and supplied to mills, weavers and other fabricators for specific end uses.

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—when General Aniline and Film Corporation asked us for a set of fireman's red control knobs* to give smart contrast to the sleek grey chassis of its Ozalid "Streamliner" and "Printmaster" whiteprint machines. Whether your need is a simple knob, bushing, or an elaborate housing, send your specifications to Creative for an analysis.

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Plastics Specification Quiz: If it's not convenient for you to send blueprints or samples, write for our "Plastics Specification Quiz". Two minutes with this Quiz will enable you to tell us which of your products may be improved by the use of plastics.

Creative

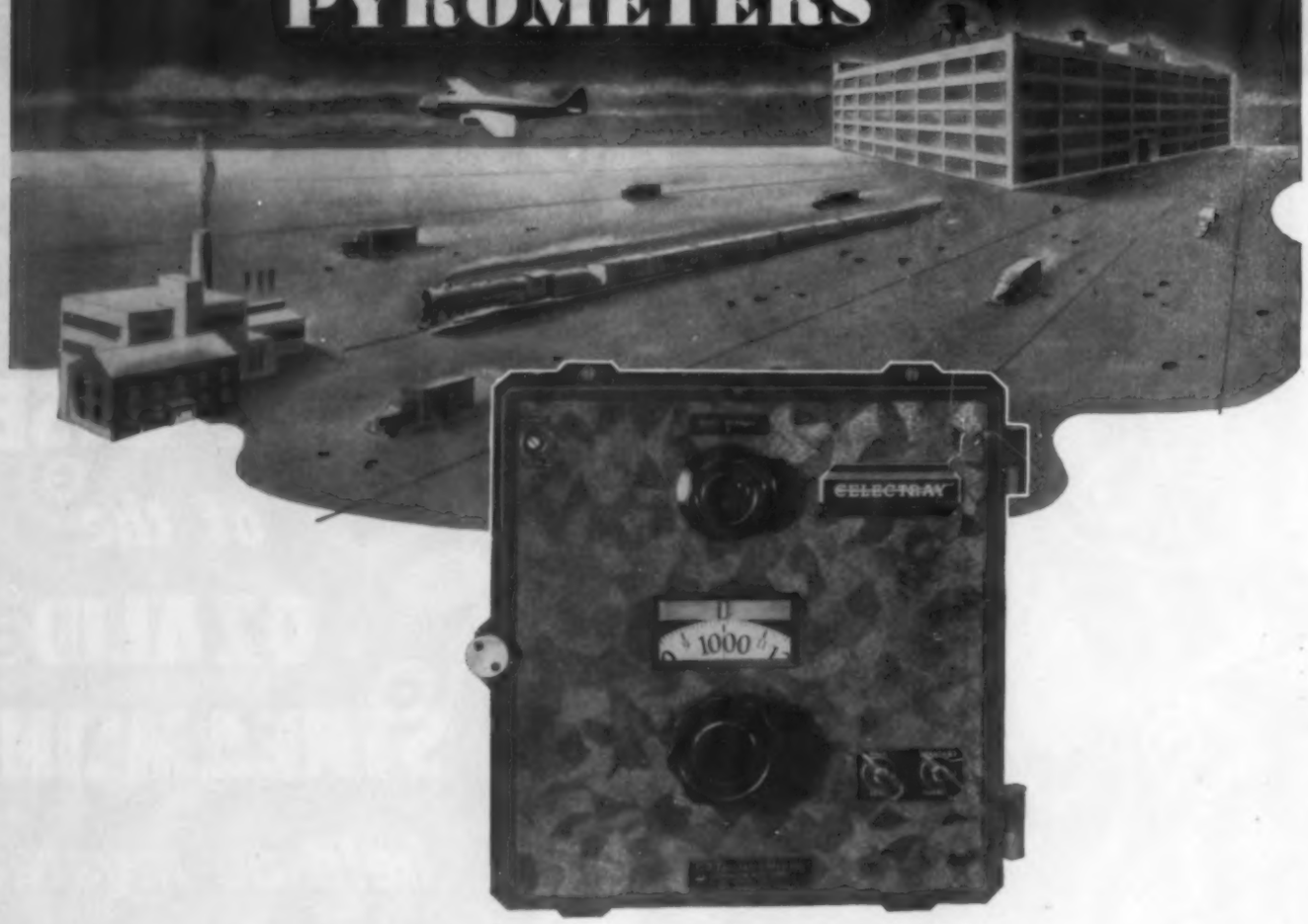
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SOCIETY OF THE PLASTICS INDUSTRY

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IMPORTANT ADVANTAGES of THE CELECTRAY Indicating Controller #48300

- No motor
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Low specific gravity means more molded pieces per pound of raw material with a consequent saving on the cost of the finished article and still further economy in shipping costs. With the lowest specific gravity (1.07-1.18) among cellulose plastics plus complete salvageability, Chemaco Ethyl Cellulose helps the molder keep costs down . . . encourages mass production of low priced articles.

But despite its low specific gravity, Chemaco Ethyl Cellulose is no weakling. It is amazingly resistant to impact. It retains its impact resistance and flexibility at low temperatures. It is also noted for its excellent dimensional stability over a wide range of temperatures. Ethyl Cellulose is the material we usually think of first in connection with any problem, it is so versatile. Probably we can adapt it to *your* needs. May we try?

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RIGHT-ANGLE-LOADED

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ROLLWAY's Right-Angle-Loaded Bearings have longer life because Rollway uses the principle of *right angle loading*. This splits every load into its component parts of pure radial and pure thrust. Each component load is carried on a separate bearing assembly at a *right angle to the rollers.*

For this reason, Rollway Bearings can use efficiently solid cylindrical rollers of greater mass and cross section area in a given space. The unit load per roller is lower and the load capacity for a given dimensional limit is higher.

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All radial loads carried at right angles to the roller axis. All thrust loads carried at right angles to the roller axis.



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Meet an INTERLAKE "Resineer"



He and his associates *FUNCTIONALLY ENGINEER* a resin to the specific requirements of each job.

Interlake's experienced specialists are helping scores of resin users improve their product and, at the same time, save money! They do this by developing custom-made resins—we like to call it *"Resineering"*. It produces a resin that is always uniform and dependable—a resin that costs no more and helps insure a top-quality product. In addition, this service eliminates costly production delays due to "adjusting" each shipment of resins.

Basically, here is how Interlake *"Resineers"* function: First, they thoroughly analyze your problem and make recommendations based upon their wide experience. Then, they develop a resin exactly suited to your application. Next, it it tested in *your* plant, working with *your* operating men. Finally, they see that Interlake's production of the resin is stabilized to insure continuous uniformity in performance.

Basic Applications of Interlake Resins Include . . .

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- **SURFACING**—wood, paper and fabric.
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...All this in addition to Perbunan's famous oil resistance, low temperature flexibility, heat aging characteristics and serviceability! There's much more we'd like to tell you about every one of these new features . . . much more you'll want to know. Write for more information, and let us help with your compounding problems.

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★ NATIONAL PLASTICS Exposition ★

To those who recall the impressiveness of SPI's first National Plastics Exposition last April, announcement of the Chicago show is headline news. In holding this exposition in Chicago the industry will present to the midwest and the nation, truly representative showing of all the new materials, machines, equipment, processes in the growing field of plastics.

It will be an *industry* show. To assure unhampered contact between exhibitors and visitors, the general public will be excluded. To all directly in the plastics industry, as well as to engineers, industrial purchasers, store buyers, designers, stylists, production managers and others whose products and functions may be enhanced by a better knowledge of plastics, SPI extends a most cordial invitation to visit the exposition. If you would like to attend the exposition, write the Society of the Plastics Industry, 295 Madison Ave., New York 17.

Concurrently **SPI** *is holding a national conference of its membership at The Hotel Stevens.*

For vital information about plastics, plan now to visit SPI's great Second National Plastics Exposition!

2ND NATIONAL PLASTICS EXPOSITION

SPONSORED BY THE SOCIETY OF THE PLASTICS INDUSTRY

★ THE COLISEUM • CHICAGO
MAY 6 • 10 - 1947

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for the Mass Production of Plastics Hardware, Toys, Novelties, Jewelry, Automotive Body Appointments

HY-MAC



MODEL IM-2

A NEW *2-ounce* MACHINE by HY-MAC

a Warren Broad design

The newly announced Hy-Mac 2-ounce Injection Molding Machine embodies advanced features of controllability, ease of operation, and production efficiency, which make it ideal for multiple production of small units by inexperienced operators. New type electronic control provides accurate temperature regulation; eliminates danger of burning material. Although rated at 2 ounces, the machine is built with 50% overload capacity. Now in production; order at once for prompt delivery.

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EXTRA strength because KYS-ITE is preformed before curing. Amazingly strong in tension and compression—and impact strength up to 5 times that of ordinary plastics.

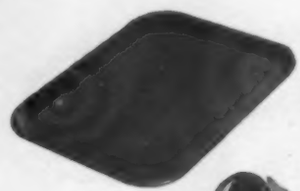




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preformed plastic combining long-fibered wood pulp and synthetic resin

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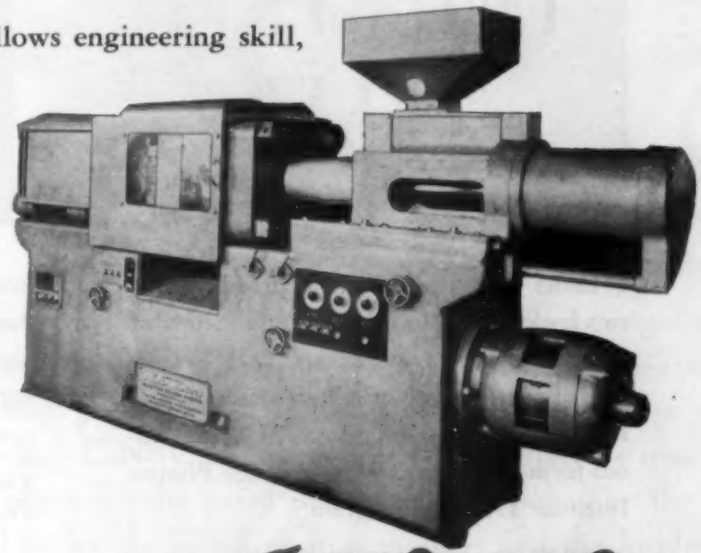
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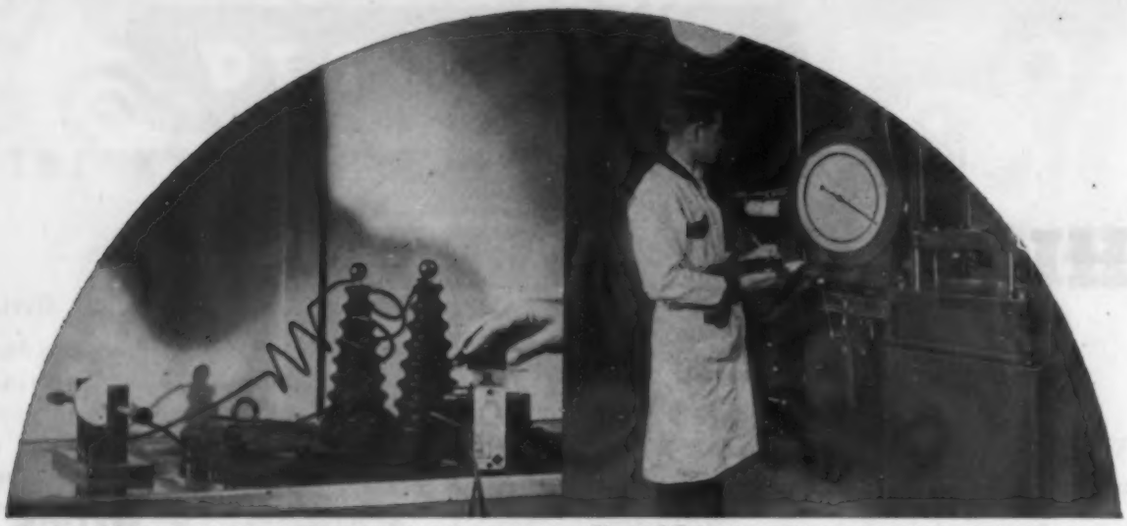
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Plastics Institute training is predicated on two basic principles: A. Thorough study of accepted practices and materials. B. Evaluation of current problems, new materials and new techniques. Standard ASTM Test Methods form an important phase of the Plastics Institute Training Program.

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Plastics

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AGAIN

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The high accuracy, ease of operation and dependability of the PLASTIVERSAL, plus its simplicity and low maintenance cost have made it an invaluable laboratory tool in plastics development.

TINIUS OLSEN TESTING MACHINE COMPANY produces a complete line of plastic physical testing machines—WRITE TODAY FOR BULLETIN No. 23.

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Testing & Balancing Machines

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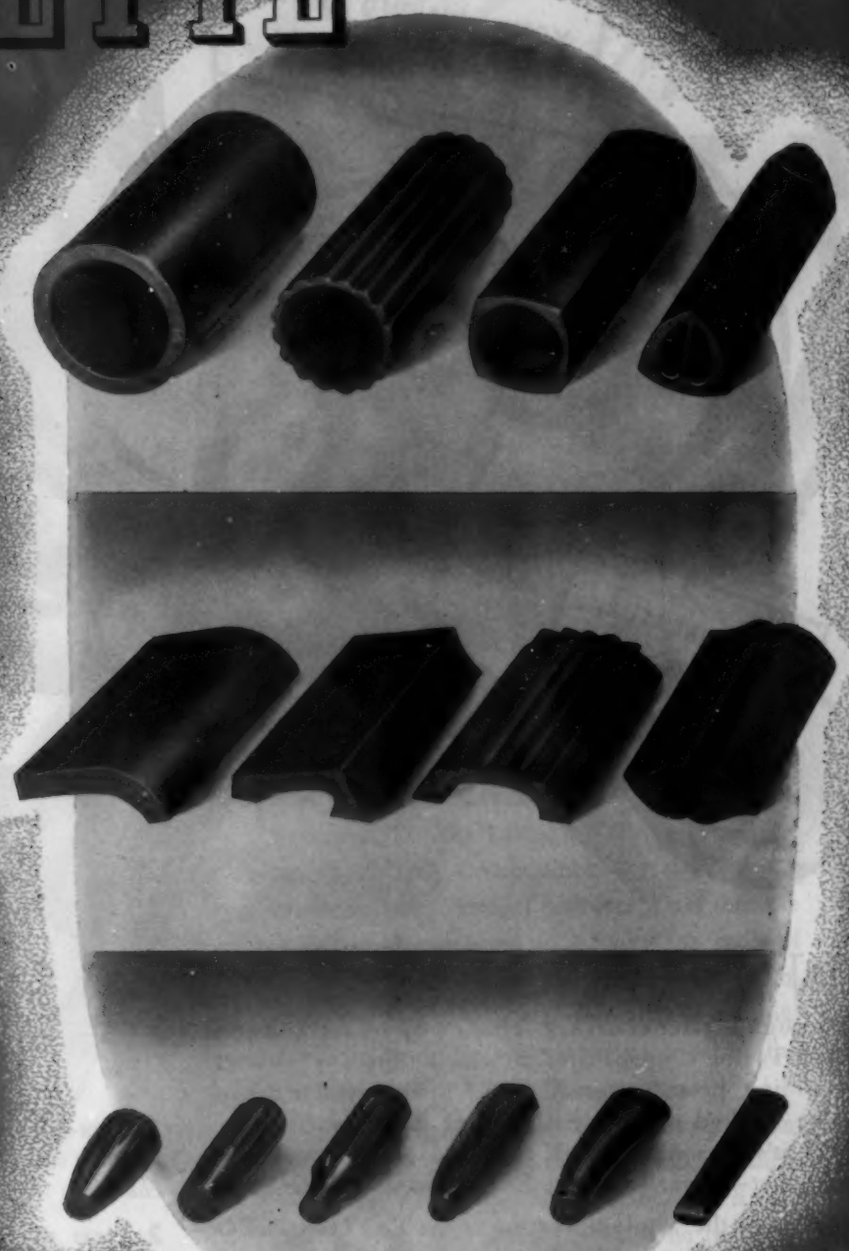
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A CAST PHENOLIC RESIN OF EXCEPTIONAL QUALITIES

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Outstanding among plastics, Marblette has a jewel-like depth and a complete color range which duplicates the appearance of precious stones, tortoise shell and ivory.

Its almost infinite variety of colors is available in transparent, translucent, opaque, or in mottled effects. Marblette also comes in a water clear form known as "Crystle" in a wide choice of colors.

Marblette's machining characteristics, resistance to oils and acids, non-inflammability and exciting beauty make it ideal for countless manufacturing needs.

MARBLETTE will help plan your world of tomorrow. The Marblette staff of engineers offers its services to help with your manufacturing problems. Write to us outlining your needs.

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THE MARBLETTE CORPORATION

Manufacturers of Phenolic Resins since 1929

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NO, we aren't against Octopi. But we do believe in helping you beat today's tough competition through greater efficiency. That's why we recommend this Taylor Control System which runs any plastics molding press automatically. This particular setup was worked out for molding phonograph records. But it's versatile enough to be adapted to whatever product—or variety of products—you want to turn out.

Brains of the whole operation is the TAYLOR FLEX-O-TIMER. Here's what happens:

1. Flex-O-Timer simultaneously: **a.** *closes press . . .* **b.** *turns on steam . . .* **c.** *positions 3-way valve to connect discharge to steam trap.*

2. Next the Flex-O-Timer simultaneously: **a.** *turns steam off . . .* **b.** *turns water on . . .* **c.** *repositions 3-way valve connecting discharge to drain.*

3. At end of molding period, the Flex-O-Timer: **a.** *opens the press . . .* **b.** *turns cooling water off . . .* **c.** *turns on steam for warm-up for next cycle . . .* **d.** *positions 3-way valve to connect discharge to steam trap . . .* **e.** *turns steam off and timer stops.*

Ask your Taylor Field Engineer or write today for Catalog No. 98154. Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada. *Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level.*

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ACCURACY FIRST
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The American Insulator Corporation, New Freedom, Pennsylvania, finds in a LEA Method and a LEA Composition the answer to a residual flash removal problem. First there is a brushing operation to remove the bulk of the flash; then LEA takes over to neatly complete the finishing. The rough edge of residual flash, shown in the picture, is removed by the LEA Method with LEA Composition.

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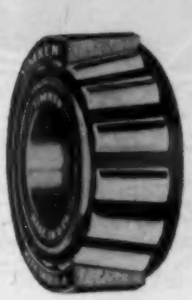
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TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.







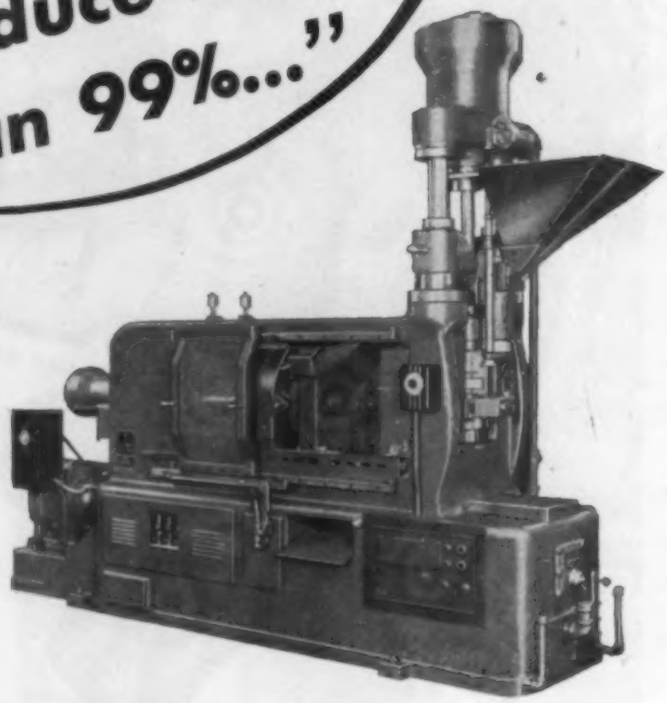




Means "Made By The Timken Roller Bearing Company." It identifies the source of Timken Tapered Roller Bearings, Timken Railroad Roller Bearings, Timken Alloy Steel, Timken Seamless Steel Tubing and Timken Rock Bits. This trade-mark is your assurance of getting genuine Timken products. Look for it when buying.

THE TIMKEN ROLLER BEARING COMPANY
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"Our LESTERS — and we have thirteen of them — have been checked over a long period of time, and their idle time for mechanical repairs and maintenance is less than 1% of total operating time. . . . That means more than 99% production."*

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Do you want a tinted mesh that won't fade . . . that will last practically forever? *Velon tinted screening* can't dent or break, never needs protective paint. It's 6 times stronger than metal . . . doesn't bleed, fade or stain in any climate.

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This versatile one ounce press is built for simple, fast set-up and operation . . . and assures quantity production of quality products. Investigate its application for your requirements.



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Manufactured by Gad-a-boats Novelty Division, Portland, Maine, the toy bus shown here was made of ½" plywood and ¾" native pine bonded together with a PENACOLITE ADHESIVE. It will support the weight of a 200-pound man and has been tested to prove that it will withstand extreme battering of child playing. After 16 months of continued childish abuse the original bus is still as solid as when first made.

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Find out about applying PENACOLITE ADHESIVES to your process. Details covering intended uses, types of materials to be treated and production methods of pressure and temperature will enable us to suggest the PENACOLITE RESORCIN RESIN ADHESIVE best suited to your purposes. Write today.

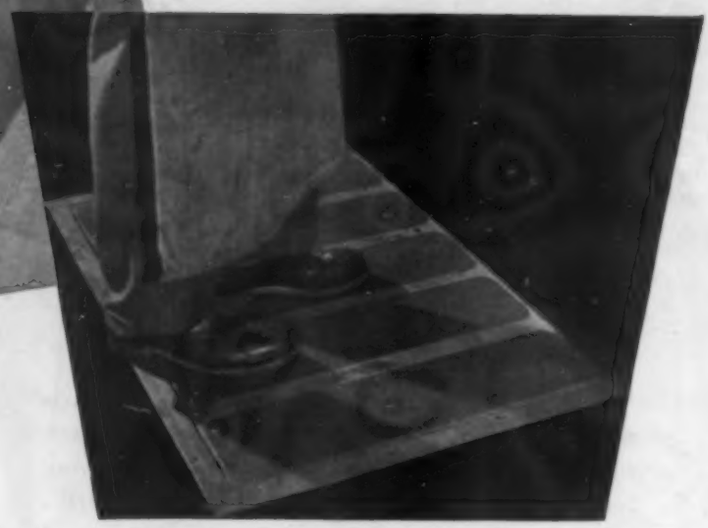
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FOOTHOLD SAFETY TREAD

Slipping, sliding, pitching, falling and all the thousands of costly accidents they cause, can now be reduced instantly, positively, and cheaply without tear-up or tie-up. Built on the same principle as heavy duty, waterproof abrasive cloth, Foothold Safety Tread stops slipping as simply as sanding an icy road. Provided in roll or cleat form for instant application to any smooth, clean, floor surface, it permits waste-free, "pinpoint" application to localized hazard areas on ramps, stairs, aisles, and walkways.

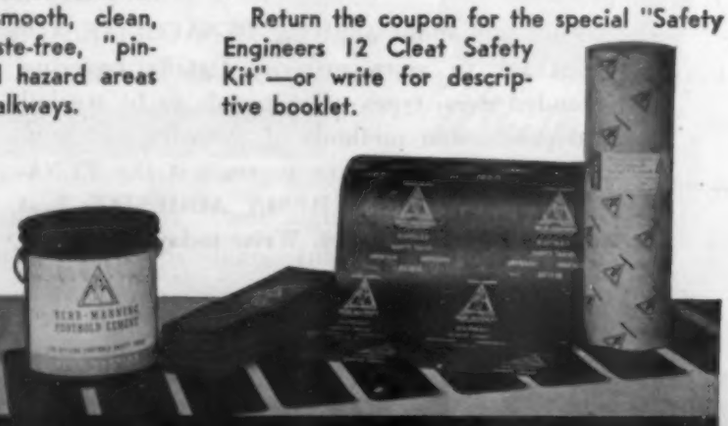
Quicker and easier to install than either mastic or metal flooring, Foothold Safety Tread has greater non-skid surface, and is fully effective when wet with water or oil. Completely waterproof and weather-proof, it resists oil, grease, alkalies and mild acids—and can be used immediately after laying.

Return the coupon for the special "Safety Engineers 12 Cleat Safety Kit"—or write for descriptive booklet.



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Please ship special FOOTHOLD SAFETY TREAD KIT containing 12 Standard Cleats 6" x 24", One Quart Foothold Cement and instructions for laying. Price $7.50.

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TO ATTAIN excellence in plastic molding, many steps—each an essential part of the whole process—must be followed through accurately and thoroughly.
Every step of the way—designing, mold making, molding, and finishing—calls for the highest skill and experience, plus the proper plant facilities for efficient production. Combined, these operations can result in quality molding... plastics that "measure up" in performance, appearance and cost.
MACK experience and proven methods, plus three completely equipped plants, offer plastic molding that qualifies. Your inquiries are solicited; address Mack Molding Company, Inc., 100 Main Street, Wayne, N. J.
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MACK PLANT AT ARLINGTON, VERMONT
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NEW STAINLESS STEEL "PERI-CASTING"

Patents are Pending

technique costs less · lasts longer... reduces Mold-making time to Days!

NOW AVAILABLE

... a NEW Peripherial Casting Technique, plus a NEW hardenable alloy (not only cased) known as "Perichrome", plus a NEW method by which an ordinary machinist can build complicated plastic molds without requiring special machine tools. Now available for Injection and Compression Molders.

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The Advantages of "Peri-Castings" are many...

1. Finest grain Stainless Steel **2.** Reproduces the model with hair-line accuracy **3.** Castings easily worked for Fit **4.** Polishes to high finish as fine as chrome plated cavities **5.** Strength 25% greater than ordinary die steel **6.** Low cost of casting plus minimum labor time means savings in cost **7.** Fine finish saves many rejects and pounds of molding powder **8.** Less finishing required **9.** A good model makes a good "Peri-Cast" mold; that's for sure **10.** Cast parts delivered in 28 days following receipt of your masters; or we will build mold complete if you can wait.

Manufactured only by

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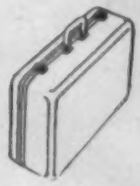
IF IT'S A CASE OF LAMINATES —Make it Cellulosics



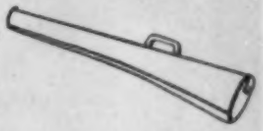
Made for American Central Division—The Aviation Corporation, by Crossdale & DeAngelis, Inc. from laminates produced by Textileather Corporation.

Meet a new, super-tough member of the cellulosics family—*cellulose derivative laminates!* A combination of fabrics and cellulose acetate or ethyl cellulose in sheet form, these thermoplastics can be deep-drawn into three-dimensional shapes, on fast cycles, without high temperatures and pressures, or the need for costly steel dies. Color is unlimited.

A current use of these laminates is the case for American Kitchen's new Plan-A-Kit, which is used in the designing of modern kitchens. The outstanding properties of cellulose derivative laminates—strength, rigidity, lightweight, built-in high finish—are utilized to make this case attractive and serviceable. This application suggests many others of a similar nature, which because of their size alone, were commercially impractical until now.



Smart, lightweight, durable, overnight and weekend luggage



Shock-proof, "quality" cases for guns, other sporting goods



Sturdy, weather-resistant housings for portable radios

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CELLULOSE ACETATE
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For general-purpose production plastics

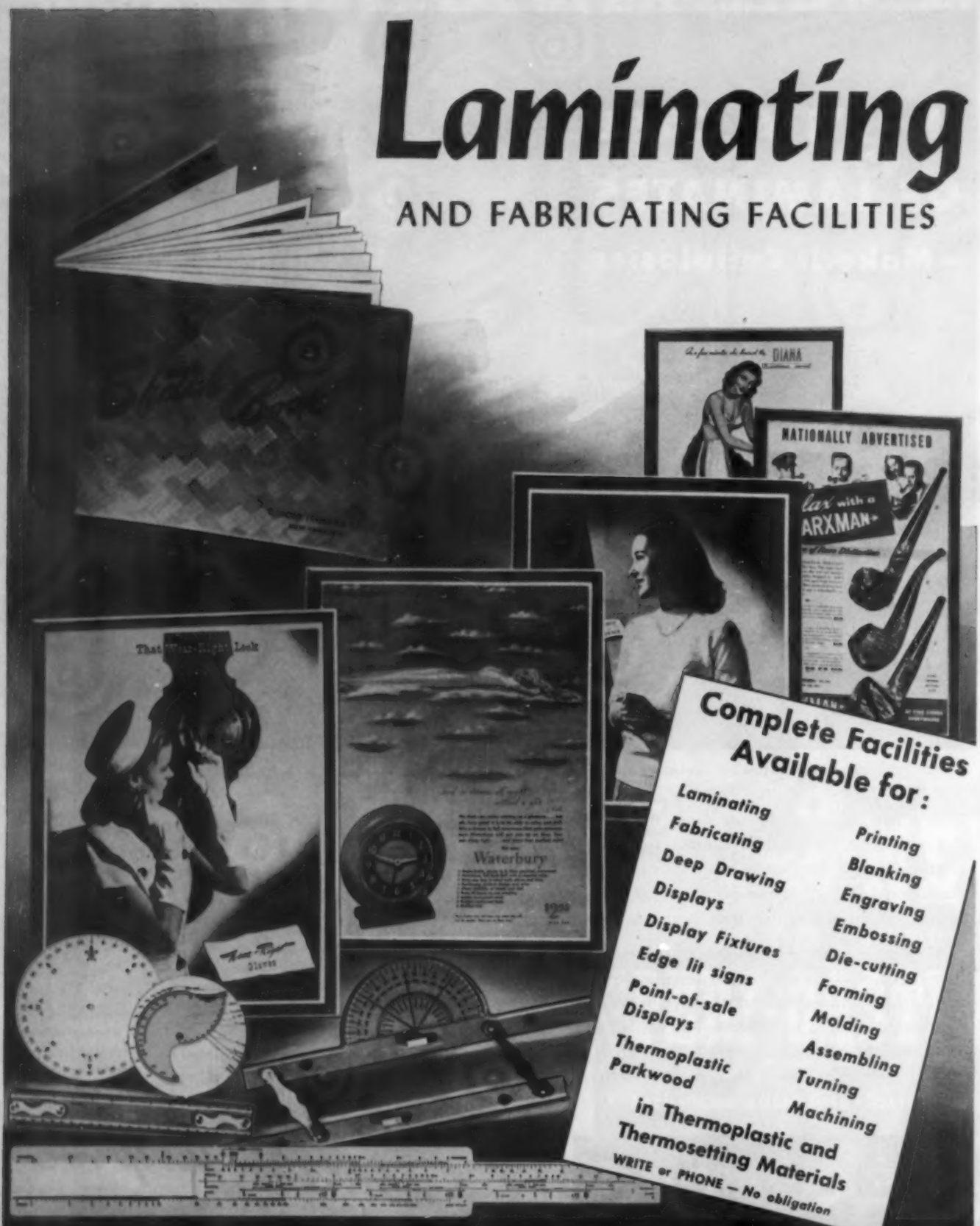
Hercules does not make plastics or molding powders, but supplies the high-quality cellulose derivatives from which they are made. For data, please write

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In the keen competition for after-war customers, with performance so closely matching performance, alert automobile manufacturers are paying increased attention to the little spots of beauty that add so much to attractiveness while adding little or nothing to cost. Naturally, Erie Resistor, pioneer in injection custom molded plastics, is in the forefront in its cooperation with car builders; in the production of parts as designed by the manufacturer; in suggesting changes in design for improvement of the finished product or for its more efficient production; and in suggesting parts that can be made of plastics, with increased economy, or utility, or beauty, or all three.

Manufacturers in other fields, too, making everything from cosmetics to washing machines, are turning to Erie Resistor for help in package and parts design and molding; for the achievement of a sales appeal that begins with the dealer's store, and lasts for the life of the product.

Whether your thinking has arrived only at the stage of wondering whether plastics may be the answer, or of complete specifications of what you want, don't hesitate to write.



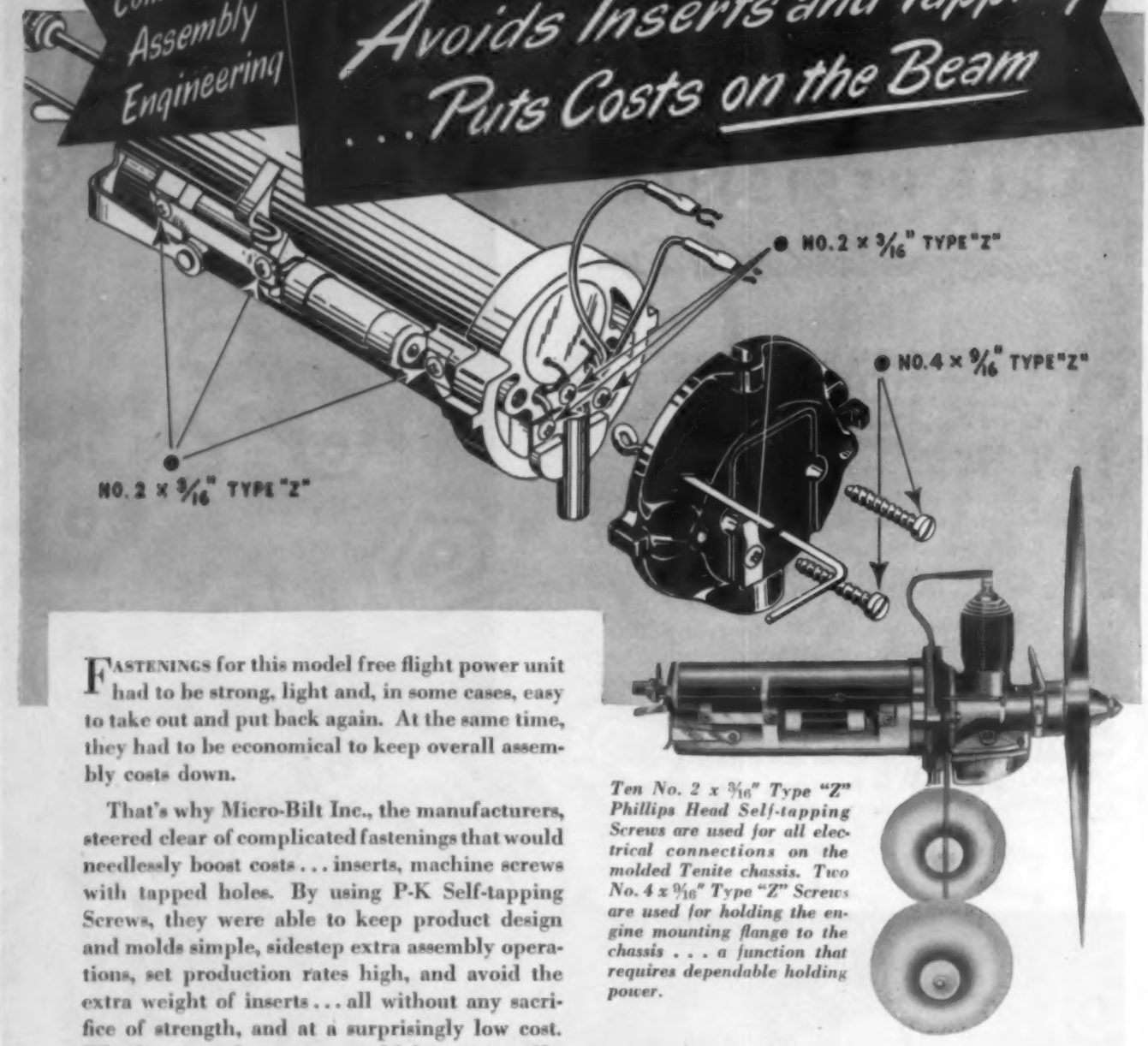
Plastics Division

ERIE RESISTOR CORP., ERIE, PA.

LONDON, ENGLAND · · TORONTO, CANADA

Common Sense Assembly Engineering

Avoids Inserts and Tapping ... Puts Costs on the Beam



FASTENINGS for this model free flight power unit had to be strong, light and, in some cases, easy to take out and put back again. At the same time, they had to be economical to keep overall assembly costs down.

That's why Micro-Bilt Inc., the manufacturers, steered clear of complicated fastenings that would needlessly boost costs ... inserts, machine screws with tapped holes. By using P-K Self-tapping Screws, they were able to keep product design and molds simple, sidestep extra assembly operations, set production rates high, and avoid the extra weight of inserts ... all without any sacrifice of strength, and at a surprisingly low cost. What's more, the screws could be repeatedly removed and reinserted with complete security.

Advantages like these are attracting more and more manufacturers to P-K Self-tapping Screws. In 7 out of every 10 cases submitted to us, they have permitted simpler, stronger assemblies with work-hour savings up to 50%.

Ten No. 2 x 3/16" Type "Z" Phillips Head Self-tapping Screws are used for all electrical connections on the molded Tenite chassis. Two No. 4 x 9/16" Type "Z" Screws are used for holding the engine mounting flange to the chassis ... a function that requires dependable holding power.

Whatever type of product you make, if it calls for fastenings, it's plain common sense to cash in on the advantages of P-K Self-tapping Screws. Why not discuss your fastenings with a P-K Assembly Engineer ... or mail assembly details for recommendations? Parker-Kalon Corp., 200 Varick St., New York 14.



PARKER-KALON

P-K



SELF-TAPPING SCREWS

A FASTENING FOR EVERY METAL AND PLASTIC ASSEMBLY

COMMERCIALLY AVAILABLE FROM DU PONT

"HARNESSED" FORMALDEHYDE

TRIOXANE

TRIOXANE is "harnessed" formaldehyde. Perfectly stable in alkaline and neutral systems, it can be depolymerized with liberation of monomeric formaldehyde by small amounts of strong acid or acid-forming materials. The rate at which the monomeric formaldehyde is released is easily controlled by regulating the amount of catalyst and the temperature.

Thus Trioxane can be used as a source of formaldehyde for reaction with various materials. In many cases it provides better control of reaction, better control of the quality of the product formed, better yields, shorter reaction time, and a generally smoother reaction than is possible with aqueous formaldehyde solutions or other formaldehyde polymers. Its miscibility with many types of organic materials makes it possible to use it as a chemical intermediate in organic reaction media.

Molten Trioxane is a solvent for a wide range of materials, e.g., phenols, proteins, aromatic hydrocarbons, amides such as urea, and many other types of organic compounds. Concentrated aqueous solutions of Trioxane also have good solvent properties. For example, the protein zein is readily soluble in such solutions. It appears likely that Trioxane-zein compositions may find commercial applications.

Trioxane can be used also in formaldehyde-hydrocarbon reactions such as the production of chloromethylated compounds by reaction with aromatics and hydrogen chloride in the presence of zinc chloride. It may also be reacted with aromatics to give diaryl methanes and hydrocarbon-formaldehyde resins.

TRIOXANE

Cyclic trimeric polymer of Formaldehyde

PROPERTIES

Colorless, crystalline compound	
Molecular Weight	**90.05**
Odor	**Mild, Pleasant**
Melting Point	**61°C**
Boiling Point	**115°C**
Vapor Pressure	
25°C	13 mm
86°C	283 "
114.5°C	759 "
129°C	1212 "
Flash Point (Open Cup)	**44°C**
Density (molten) @ 65°C	**1.170**
Solubility	
Water	Readily Soluble
Alcohols	" "
Ketones	" "
Ethers	" "
Esters	" "
Chlorinated Hydrocarbons	" "
Aromatic Hydrocarbons	" "
Naphthalene	" "
Phenol	" "
Vegetable Oils	" "
Petroleum Ether	Slightly Soluble

FOR TECHNICAL ASSISTANCE and copies of Bulletin F-300-1146, which gives more information about Trioxane, write or call our nearest District Office. E. I. du Pont de Nemours & Co. (Inc.), Electrochemicals Department, Wilmington 98, Delaware.

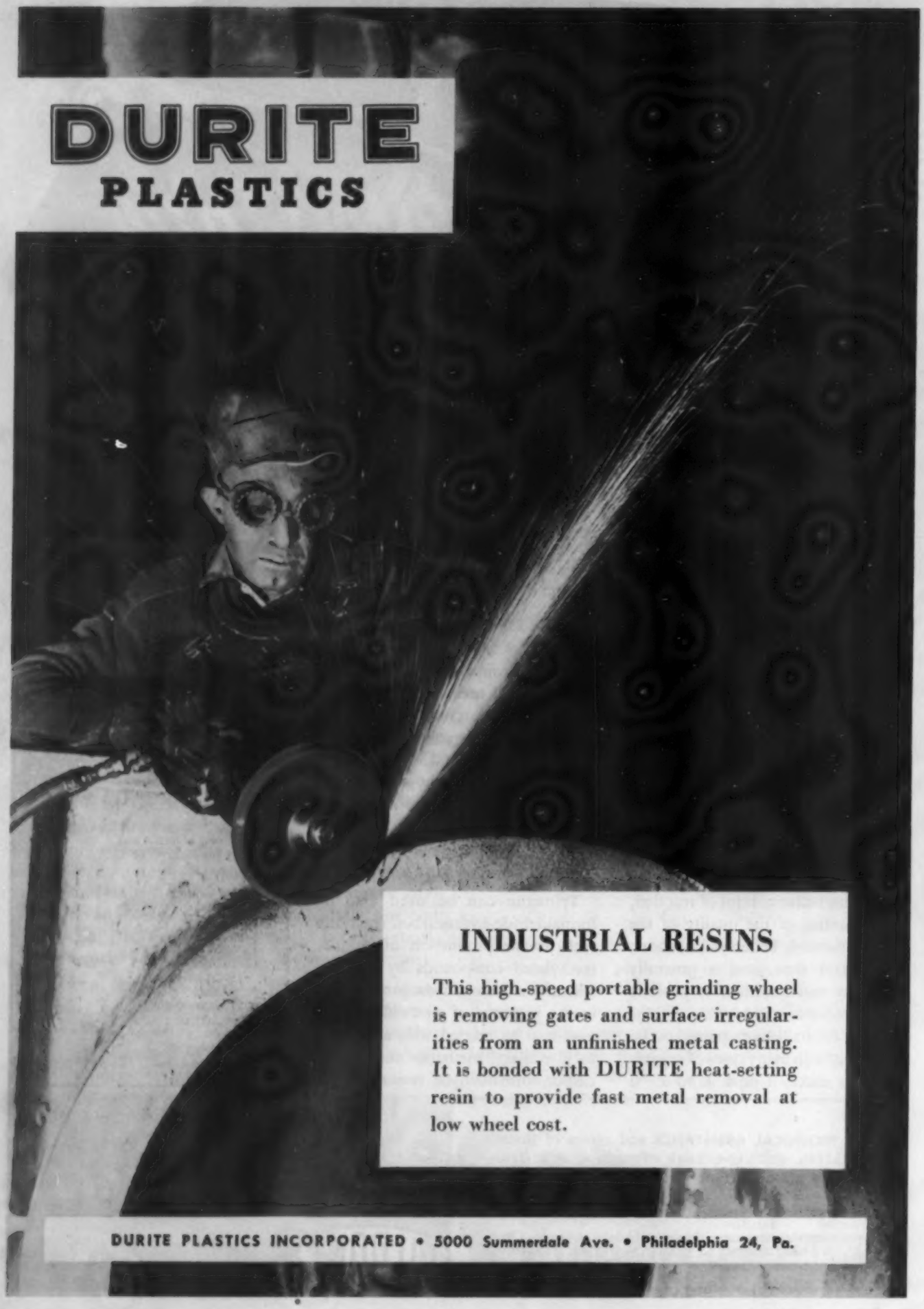
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INDUSTRIAL RESINS

This high-speed portable grinding wheel is removing gates and surface irregularities from an unfinished metal casting. It is bonded with DURITE heat-setting resin to provide fast metal removal at low wheel cost.

DURITE PLASTICS INCORPORATED • 5000 Summerdale Ave. • Philadelphia 24, Pa.

Plastics where plastics belong

A rare combination of mechanical, electrical, and chemical properties fit Synthane (our type of plastic) for a countless number of useful applications. Aside from its moisture and wear resistant qualities, Synthane is also light, dense, strong, easily and quickly machined, an excellent insulator, and a material for fighting corrosion. Here is a unique and dramatic example of the use of plastics where plastics belong and Synthane where Synthane belongs.



This outboard motor pivot bearing (above) requires no lubrication... resists both salt and fresh water, wears long and well . . . it's Synthane. If these few of Synthane's many properties suggest a possible use of Synthane in your product, let us help you—in the design stage. Perhaps we can save you time and money. Meanwhile, get further information. Send today for the complete catalog of Synthane technical plastics. Synthane Corporation, 8 River Road, Oaks, Pennsylvania.

SYNTHANE *where Synthane belongs*

DESIGN · MATERIALS · FABRICATION · SHEETS · RODS · TUBES
FABRICATED PARTS · MOLDED · MACERATED · MOLDED-LAMINATED

(over)



READY FOR THE "PROFIT HANDICAP"?

Cost-plus thinking and easy profits have reached the end of their rope according to all business barometers. Business is once again off to a free enterprise race.

Better products for less manhours and lower costs are now interesting production managers, product engineers and purchasing agents and they are showing intense interest in methods and materials that promise these improvements.

Synthane (our type of laminated plastics) is made to order for current designing. Its combination of properties, makes it applicable to literally thousands of uses. It is, for example, one of the best of electrical insulators. It is also moisture, corrosion and wear resistant, possesses high mechanical strength and can be quickly and easily machined.

Synthane may help solve one of your product problems. If you feel you have a use for Synthane, let us help you before you design. We may be able to save you time, effort and money and help put you "out in front" of competition. Send the coupon below for your copy of the Synthane Plastics Catalog.

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SYNTHANE CORPORATION, 8 RIVER ROAD, OAKS, PA.

Gentlemen:

Please send me without obligation the complete catalog of Synthane technical plastics.

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Company_____

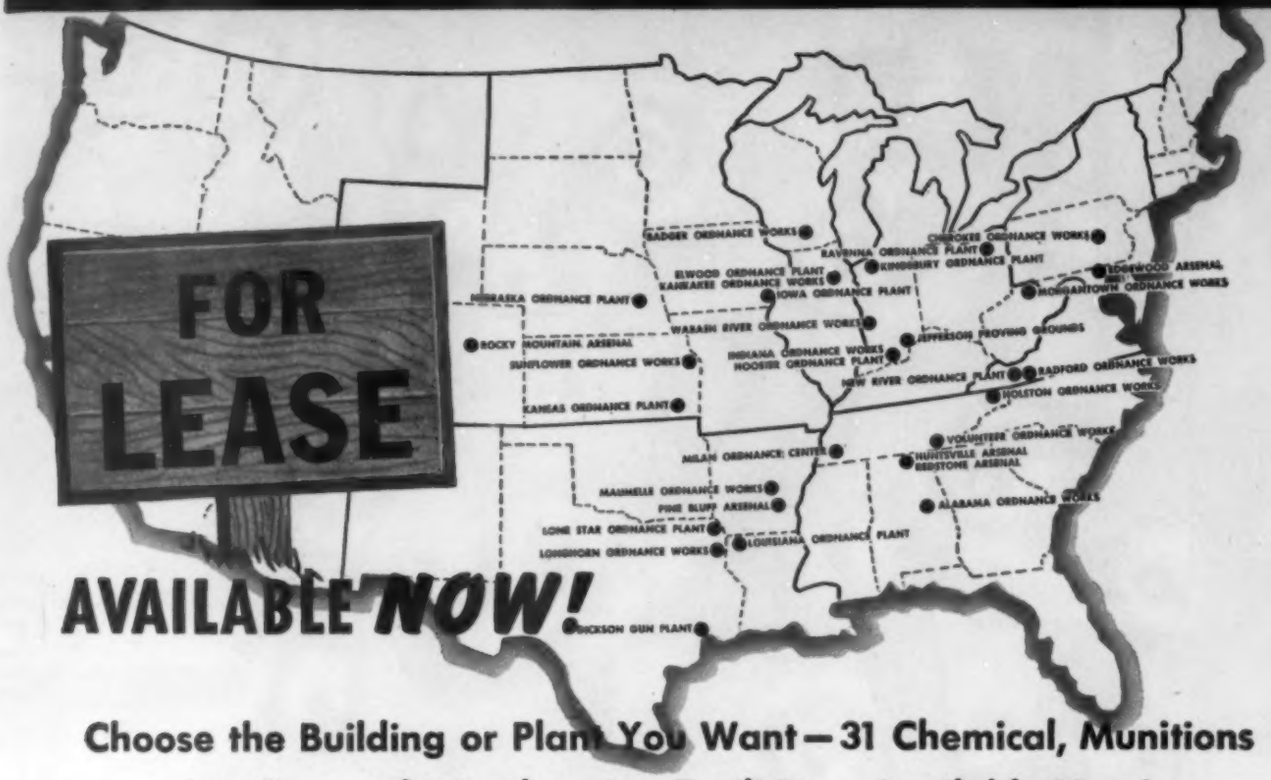
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Convertible to the manufacture of fertilizers, paper products, textiles, chemicals, plastics, metals and alloys, electrical and electronic equipment, building materials, furniture, packing and assembly line operations for foods, beverages and other products.

Good labor markets and transportation.

These plants, which include complete shop and repair facilities, office buildings and utilities, were formerly used for production of oleum, nitric acid, ammonium nitrate, concentration of nitric and sulphuric acid; guns, pyrotechnics and similar items; ethylene, carbon-monoxide, phosgene, formaldehyde, hexamine and chlorinated liquid and gaseous products; carbonyl iron, paste products; fabricated wood and textile items; chemical production and reduction operations.

Present facilities include glass lined, stainless steel, high chrome iron and steel batching equipment; mixing tanks, storage for concentrated acid and other types of chemicals; equipment for nitration and reduction operations, fractional distillation, and allied multiple operations. Mechanical conveying and handling equipment available at most plants.

Over 200,000 acres of agricultural and grazing land also available for lease.

* * *

Rentals will be established by competitive bids. Closing dates for individual plants may be obtained from the Division Engineer. Arrangements for inspection of plants should be made with the Division Engineer having jurisdiction. Address all requests for complete information and "invitation to bid" to the Division Engineer of the Division in which the plant is located.

This information is not intended for use as a basis of negotiations. The Corps of Engineers reserves the right to reject any or all proposals.

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Cincinnati, Ohio

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CHIEF OF ENGINEERS, U. S. ARMY, Washington 25, D.C.

CORPS OF ENGINEERS

U. S. ARMY
WASHINGTON, D. C.

We almost lost a job the other day



—because our price was 2% high

The Purchasing Agent was somewhat peeved. True, he was familiar with our quality of work; the delivery promise was convenient, and he had confidence in our ability to come through as scheduled. But the 'Brass' in the main office would want more reasons for paying more.

Selling Watertown was easy because there were so many 'extras' to offer, so many more facilities included in our price. There were, for example, provisions made for the complete testing of the raw material to ensure that the product would be molded of material that met our most stringent specifications. We had planned on checking the end-product periodically on our Flexural and X-ray equipment. Then the product was to run the gamut of a rigorous inspection to insure conclusively the dimensional stability which would facilitate the final assembly. This final process alone was enough to overcome the price differential. The upshot of the matter was that Willie Watertown walked out with the order.

Perhaps we can help you too. Let us in on some of your tough molding problems. We've been handling the toughest ones for thirty-four years.

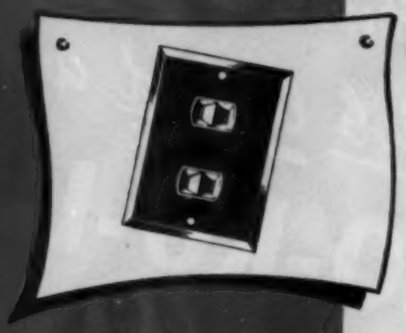
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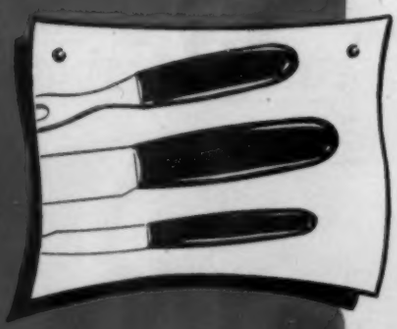
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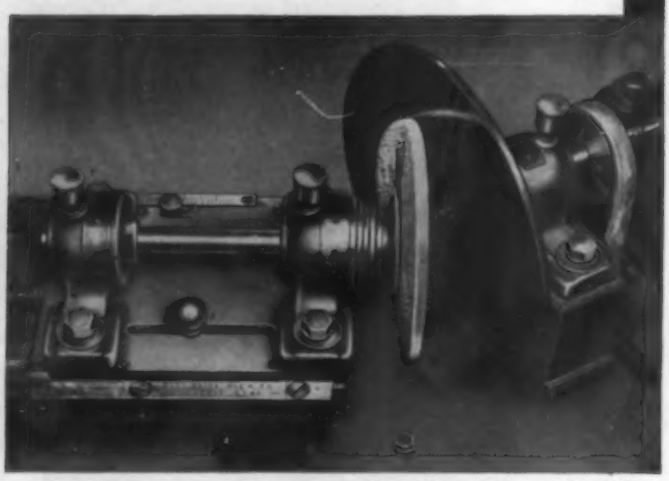
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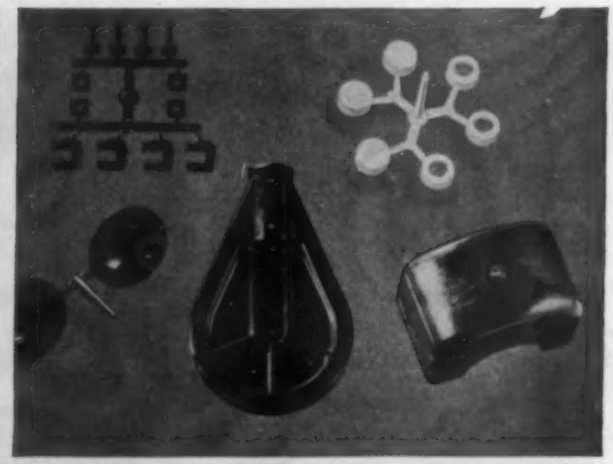
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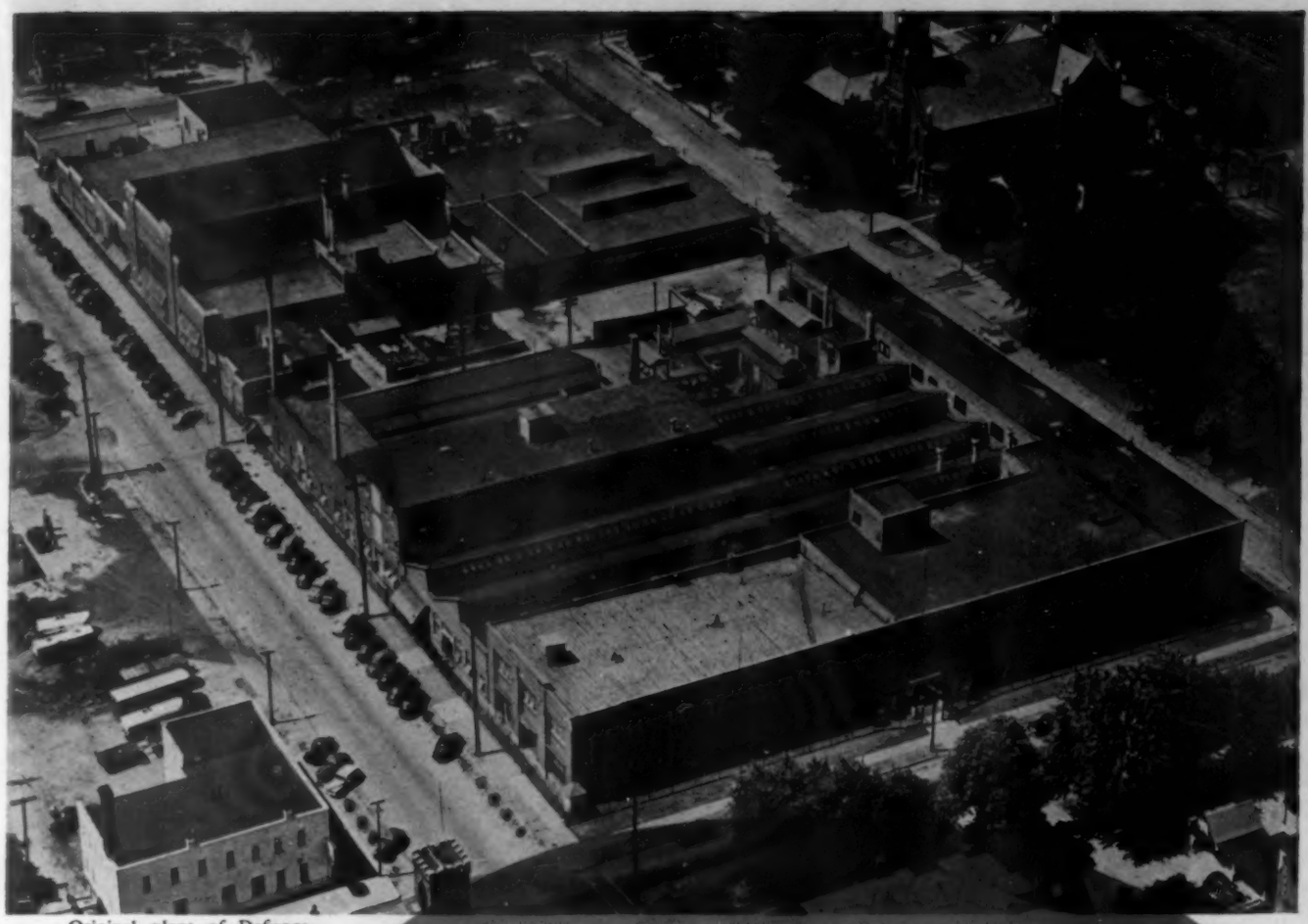
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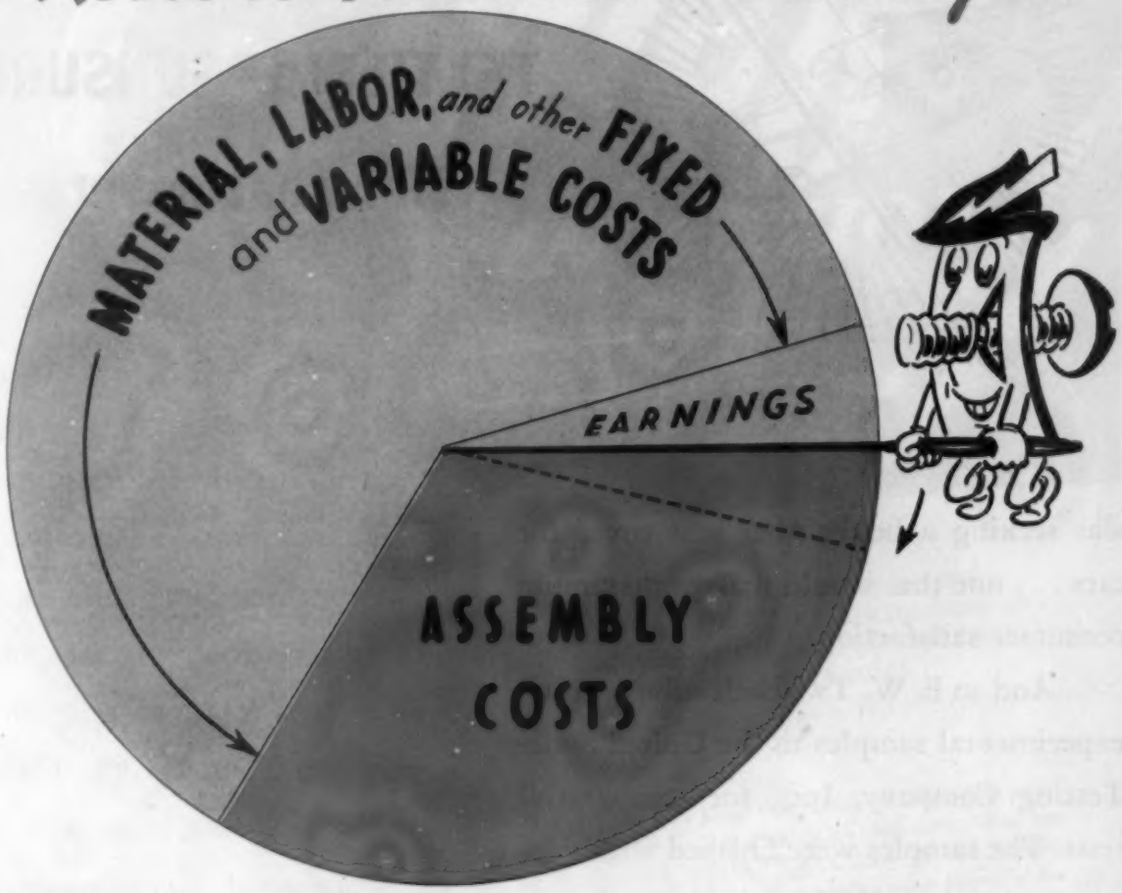
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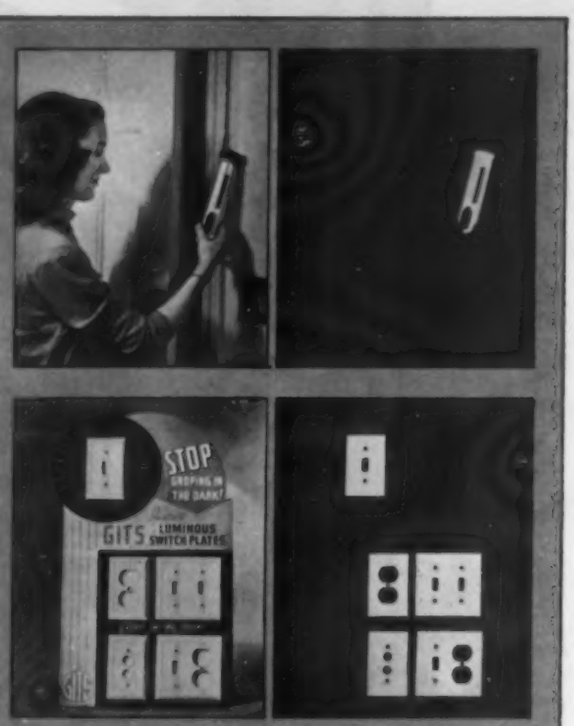
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TROY, NEW YORK

"101 *USEFUL Luminescent* APPLICATIONS"

The BIG Little Booklet that's Full of *Glowing* Ideas

THIS booklet has eight major chapters: (1) SAFETY AIDS, (2) TOYS-GAMES-GIFTS-NOVELTIES, (3) ADVERTISING-DISPLAYS-PREMIUMS, (4) INTERIOR DECORATION, (5) RADIO-TELEVISION, (6) AUTOMOTIVE, (7) AVIATION and (8) MANY ADDITIONAL USEFUL APPLICATIONS. Many of the luminescent applications are illustrated with photographs—like the ones at the right. Many more are mentioned in the text. These probably will suggest to you many new, practical, profitable applications.





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Physical Properties

Formula:

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%BF_3: 47.8% min.

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3. As a cyclizing agent for rubber.

4. As an esterification catalyst.

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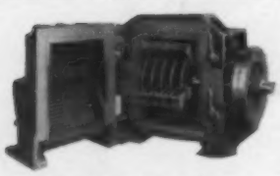
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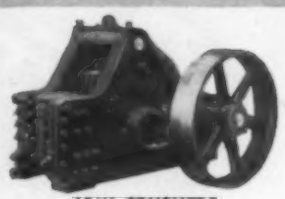
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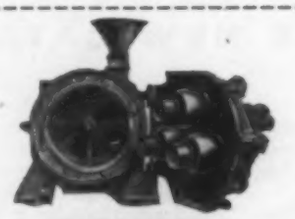
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for coarse and medium reduction (1" to 20 mesh). Open door accessibility. Soft, moderately hard, tough or fibrous substances. Built in several types and many sizes.



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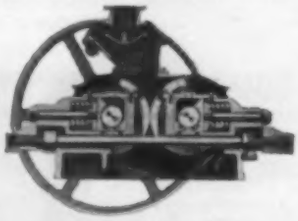
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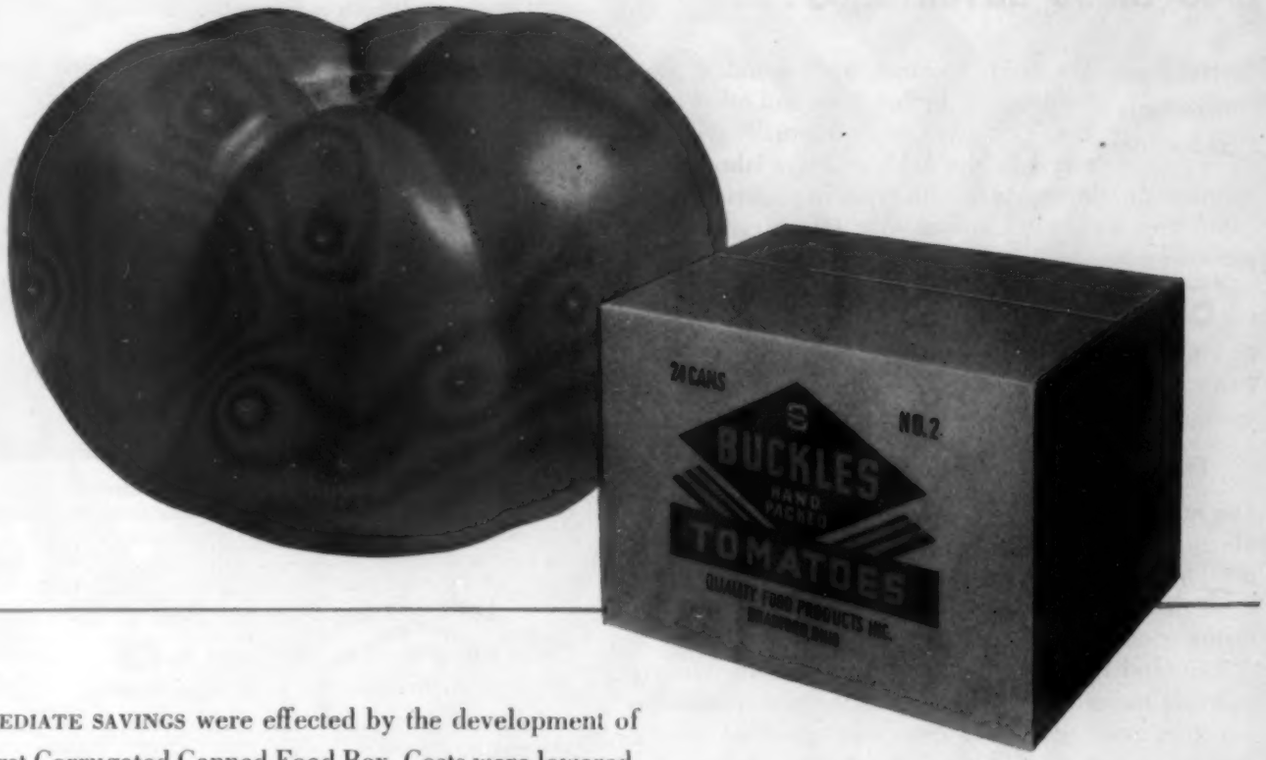
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When you select a molder with facilities for both rubber and plastics . . . you get precision molding plus these advantages . . .



Fine for plastics—Cellulose-Acetate Butyrate for stability and moisture resistance was chosen. This valve cap, with special dirt protector, involved an intricate die design and precision molding, as threads had to fit easily on assembly without further machining.

Help on materials selection We have research and manufacturing facilities for both rubber and other plastics. This gives us an unusually wide interest in the field, and our laboratories test new developments in both types of materials.

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Our engineers have been called in frequently by manufacturers during the early design stages of their products. In many instances, they have been able to suggest design changes which cut molding and other manufacturing costs.

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Fine for rubber—Hard rubber for dielectric strength, high temperature characteristics and moisture resistance was chosen for this magneto housing—an intricate precision molding job involving inserts.

Let's get together on your problem

If you are planning or using large quantities of a molded product, chances are that our experience and facilities for volume production will enable us to fill your needs at a reasonable cost.

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Injection molding capacity available

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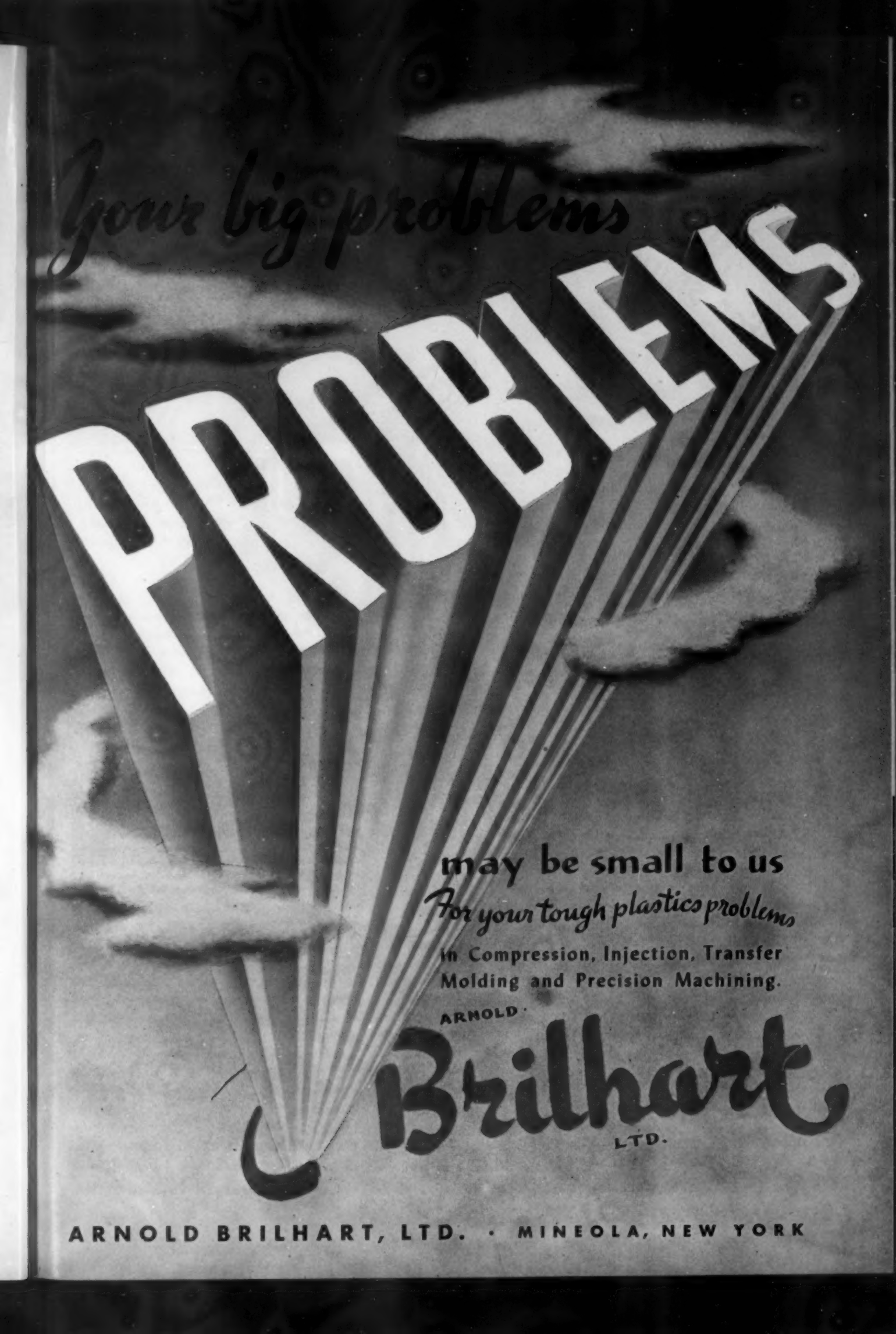


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for smooth, stable, neutral emulsions



Just add Water to "PLASTOLEIN" X-483*

There is no need to use an "outside" emulsifying agent or emulsifying equipment with Plastolein X-483. It is a self-emulsifying plasticizer compatible with latices. Completely neutral itself, X-483 will not alter the pH of vinyl and rubber latices.

X-483 is compatible with the vinyls, nitrocellulose, cellulose acetate-butyrate, methyl methacrylate, etc. While it is recommended for emulsion applications, it works equally well as a straight plasticizer for elastomeric extrusions, surface coatings, coated fabrics and plasticized films.

*"Plastolein" X-483 is available in limited quantities.

"Plastolein" X-55—Diethylene glycol dipelargonate has an average boiling point of 232° C at 5mm pressure. It is soluble in most common solvents and compatible with the vinyls, nitrocellulose, ethyl cellulose, cellulose acetate-butyrate, methyl methacrylate, etc.

"Plastolein" X-484—Same compatibility range and exceptional plasticizing characteristics as X-55, "Plastolein" X-484 has been developed especially to improve ultraviolet stability.

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MODERN PLASTICS

VOLUME 24 APRIL 1947 NUMBER 8



PHOTOS, COURTESY OWEN-CORNING FIBERGLAS CORP.

This 16 1/2 ft. inboard-motor boat, molded from glass fiber fabric impregnated with polyester resin, weighs 600 lb. as compared with about 1800 lb. for conventional wooden boat



Three pieces comprise this motor boat—the hull, deck and seat unit. All are molded in female cast metal molds without the use of an autoclave. The hull has a wall thickness of 1/8 in. but it has bosses and ribs molded in

Economics of low pressure plastics

THE purpose of this article is to assess the present economic position of the low-pressure plastics industries and to provide at least a compass bearing on their future course. They were born of war. Their ancestors include plywood, paper maché, high-pressure laminates, bowler hats and reinforced concrete. Their wartime accomplishments in aircraft parts, military housings, radomes, helmets, boats and other items were noteworthy. BUT war production is not production for competitive markets; wartime costs are much less important than peacetime costs. Where the low-pressure industries go from here will depend on how economically they can produce, how fast they can produce, how soon they can establish quality standards and how well they can maintain them, and how many new things they are able to provide to add to the comfort of the people.

Because of the confusing terminology of the field, including such terms as contact lamination, low pressure molding and impression molding, we shall try to present the products, materials and methods in simple terms. Let us start by arbitrarily differentiating between low-pressure molding and laminating in this manner: a piece produced in curved shape is molded; a piece produced flat is laminated, even when it contains only one sheet of filler material.

These definitions are used to clarify the discussion that follows, since every man in the field seems to have a definition all his own.* At the S.P.I. low-pressure meeting in Chicago, the suggestion was made that laminating be designated a technique in which the filler retains its identity (as glass cloth) while molding be declared a technique in which the filler loses its identity. One man in the field suggested that laminating

COMPARISON OF HIGH PRESSURE & CONTINUOUS LAMINATES

HIGH PRESSURE LAMINATES		CONTINUOUS LAMINATES
High-pressure laminating plants have a tremendous capital outlay. No figures are available to show relation between investment and output. Capital devoted to research development is a small percentage.	CAPITAL COST IN RELATION TO OUTPUT	Two contact laminators informed MODERN PLASTICS that a capital investment in plant of over $100,000 could be expected to produce a volume of $200,000 per month. Much depends on the ingenuity of the management.
Three kinds of plates: polished, satin finish and dulled, and four plates for each six sheets are required in high-pressure laminating.	PLATES USED AND FINISHES	No metal plates are required, but only two finishes possible (satin and shiny) to date in contact laminating. Other finishes may later be developed, through the use of carrier paper coated with special resins.
Largest sheets now made trim to 48 by 96 inches. Fabricators state that a 3 by 8 ft. rigid sheet is the biggest one man can handle.	SIZE OF SHEET POSSIBLE	Sheet size is unlimited as to length and may be had up to 80 in. wide. In rigid laminates this is no advantage, but in flexibles which can be rolled, it is important.
In high-pressure laminating, the top sheet of a decorative laminate is printed paper impregnated and coated with melamine resin. Any decorated paper on which specified inks have been used can become surface sheet.	DECORATIVE POSSIBILITIES	By the use of printed or woven design fabrics or printed paper, an unlimited range of decorative sheets is available in the contact laminate. Problems arising out of the reaction of resins to inks are rapidly being overcome.
Using paper with melamine or urea resins, translucent laminates are made which are formable only to limited radii.	TRANSLUCENT LAMINATES	The possibilities for translucent thermosetting laminates by low pressure are obvious. Materials now under development are expected to be quite formable.
For table tops and wall panels, high-pressure laminates are applied to hardwood plywood cores, a bottom and top skin being generally applied in interests of balance. Softwood will telegraph its grain if a positive adhesive is used.	APPLICATIONS TO CORE MATERIAL	The contact laminates are declared to be applicable to softwood plywood and other low compression strength cores with very little pressure, but the grain-telegraphing problem exists here, too. In some cases "green" skin laminate is being applied experimentally to core material and cured in position.
High-pressure laminates of phenolic type, generally with fabric filler, are readily formable. Decorative laminates with melamine surfaces are postformable only to limited bends. They are said to be more difficult to machine than contact laminates.	FORMABILITY AND SHAPING	Postformability of fabric-filled contact laminates is stated to be exceptional, although very few applications have been marketed to date. Paper-filled flat polyester laminates have not yet been made postformable to compound curves.
High-pressure laminates use high-strength papers in decorative uses; paper, fabric, glass fabric and glass mat in industrial uses. Best papers run about 15 cents a lb.; phenolic resin costs as high as 40 cents a lb. on a dry solids basis; melamine for surfacing about 40 cents a lb.	FILLERS AND RESINS USED AND THEIR COSTS	Fabrics for use in continuous laminating cost anywhere from 90 cents to $1.25 a pound. For decorative laminates, usually one or two layers of fabric or five layers of paper are used for 1/16 in. material. Resins cost from 30 to 50 cents. Paper filler costs are the same as those for high-pressure laminates.
Abrasion resistance, impact strength, shear strength, resistance to moisture, alkalis, acids and oils in high-pressure laminates are so high as to be target standards for all competing materials. Use of aluminum foil below top sheet gives a heat-resistant product. No flexibility is possible with a high-pressure laminate.	PHYSICAL QUALITIES OBTAINABLE	No property standards have been set in continuous contact laminates, but formulations can be produced to give quite satisfactory results. They can be made cigarette-proof with the use of aluminum foil. They can be made resistant to many acids, alkalis and stains. They are sufficiently moisture resistant for most expected applications.
A single 16-opening high-pressure laminating press 3 by 8 ft. can turn out 13,824 sq. ft. of laminate in an 8-hr. day. High-pressure lamination is much faster than is commonly supposed.	LABOR AND SPEED OF PRODUCTION	A continuous laminating machine capable of turning out 11,520 sq. ft. (4 ft. wide at 6 ft. per min.) per 8-hr. day uses four employees on direct laminating operations.

be the standard term for all low-pressure work, while another suggested that only the term molding be used.

Selecting a resin

All low-pressure work, whether the resins used are thermosetting or thermoplastic, is done with resin plus one or more fillers which are generally in sheet or mat form. On the product to be made, its use, the quantity ordered, the finish desired, its method of assembly and its target price will depend the choice of resin and fillers and method of manufacture.

The thermosetting group of resins embraces specially compounded low-pressure phenolics, and a large number of unsaturated polyesters, each of which is made up of two or more monomers (such as a styrene or other vinyl type) plus catalysts, inhibitors and other chemicals designed to control the speed of cure. Numerous back issues of this magazine as well as the MODERN PLASTICS ENCYCLOPEDIA for 1946 contain detailed information about the structure of the polyesters. Many more than 50,000 mixtures are possible with the use of materials now known, and the resulting products (to some extent depending on the filler used) can have a tremendous range of qualities in strength, flexibility, abrasion resistance and hardness.

Low pressure thermoplastic applications to date have been largely confined to cellulosics although some experimental work is being done with both vinyl and polystyrenes.

Pressure and heat for cure

All these resins take form under pressure but, unlike other molding and laminating resins, they may be formed with pressures ranging from zero, as in casting, to over 1000 p.s.i. Those which take shape at under 50 p.s.i. are generally referred to as contact resins. Any given resin may be used with a reasonably wide range of pressures, depending on the filler, the proportion of resin to filler and the qualities desired in final product.

Some of these resins require applied heat to cure; some cure by chemical reaction generated by catalysts added to them; others cure by means of heat plus catalytic action. Each formulation has its optimum working heat. A slight bit of doctoring on a resin will necessitate a change of heat and cycle. The highest heats used are generally much lower than those applied in injection or compression molding or in high-pressure lamination. Some flexible resins cure at heats to 380° F.

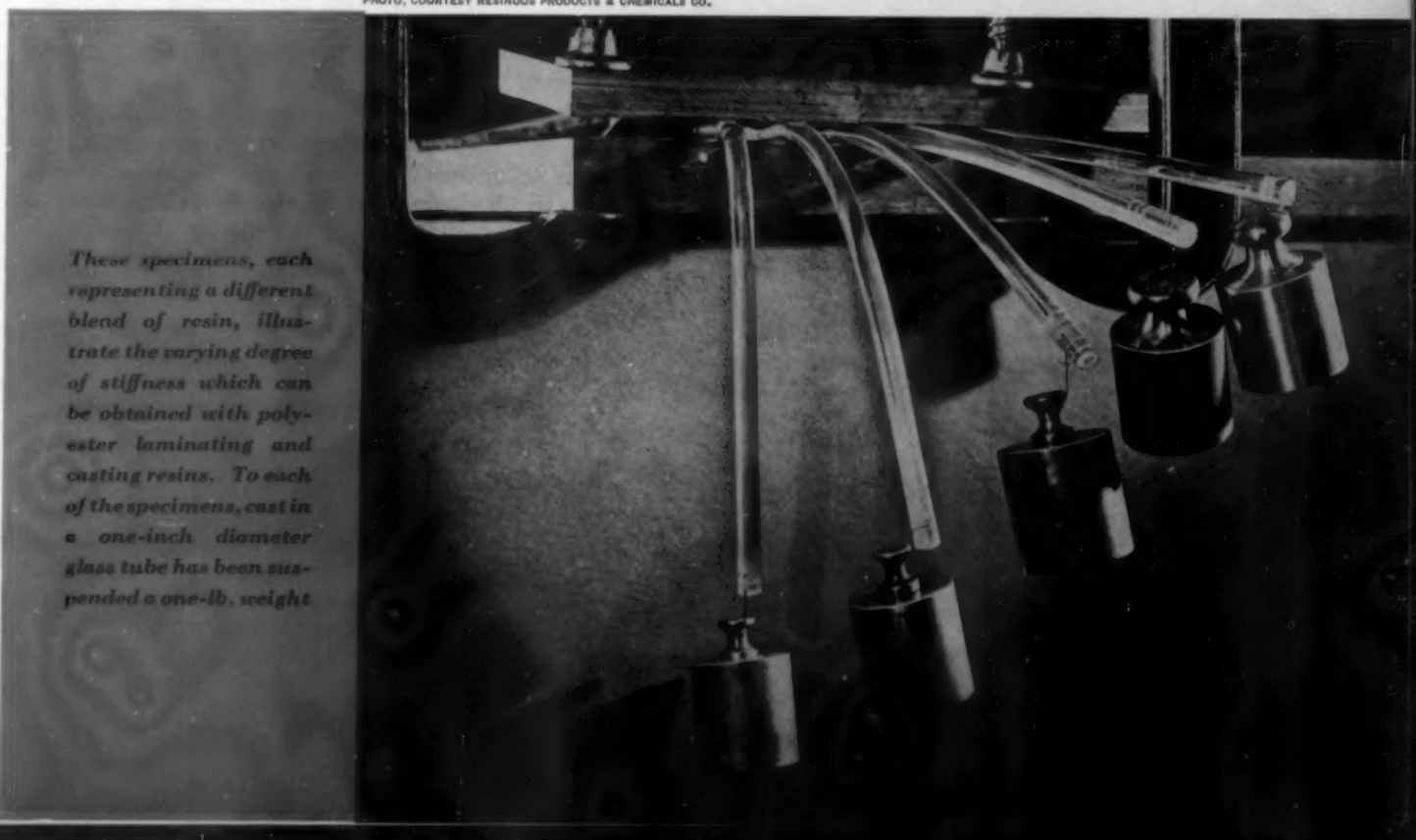
Low-pressure fillers

Fillers are pulp, paper, woven or knit fabric, fibers, glass fabric and mat, woven nylon and rayon, and even polystyrene floss. Plywood, both flat and molded, comes into the low-pressure range but is generally considered a separate method.

Key element of "know how" in these industries is the balance of resin to filler in the molding or laminate which will produce the best combination in the finished job. Because low-pressure products compete with other articles on a basis of strength and rigidity in relation to weight, the filler and resin must be selected and balanced on a basis of their strengths and moduli of elasticity in order that the highest combined strength and rigidity may be obtained. The M.O.E. of a resin may be changed by changing the formula; the strength and M.O.E. of a filler for a given weight or volume may be easily determined separately. In theory a good laminate is a homogeneous mass, so the ideal balance of resin to filler would be 50-50 by volume. This is seldom possible or even desirable, because that ideal combination would not be likely to have the proper qualities.

(Please turn to next page)

PHOTO, COURTESY RESINOUS PRODUCTS & CHEMICALS CO.



These specimens, each representing a different blend of resin, illustrate the varying degree of stiffness which can be obtained with polyester laminating and casting resins. To each of the specimens, cast in a one-inch diameter glass tube has been suspended a one-lb. weight



To form body of this electric runabout, glass fiber fabric impregnated with unsaturated polyester resin is laid over a male mandrel

PHOTO, COURTESY AMERICAN CYANAMID CO.

A good example of this principle of imbalanced M.O.E.s is Doron, the polyester-glass fabric flak armor developed during the war. The ratio of glass to resin by weight was very heavy and when the shrapnel hit the piece, the piece delaminated and fractured, but the energy absorbed by this delamination was sufficient to stop the shrapnel.

The ideal homogeneous balance of resin to glass fabric would have made a product with much less strength for the purpose, since the fracture qualities were required. The glass was merely held in place by the resin.

It can be seen that each individual application in low-pressure work demands careful study and, frequently, much experiment. The materials are not cheap.

Lowered mold and tool cost

Low-pressure molds and tools may be made of materials with low-tensile strength, so are generally cheaper than those used for high-pressure laminates. They may also be far larger than any tools yet devised for high-pressure work, so the resulting pieces will be larger. Wood, plaster of Paris, cast chrome-plated brass, cast iron, cement, aluminum, and sheet and tool steel have been used.

The type of mold is determined by length of run, size of piece, class of filler, type of job, amount of heat and pressure and the way they are applied. An axiom in the field is that the cheaper the molds and tools, the slower and shorter the job—and if the quantity justifies the tool expense the job would be better done by high-pressure with high-pressure materials! But there is more to it than that.

Take, for example, Andover Kent's ice bucket.[1] That job required curves beyond the possibilities of present postforming techniques. Tolerances were fairly close because half the cost was in assembly costs and cost of applying pressure, the individual sheet lamination offers also a product which may be flexible or stiff, and which may have many different kinds of fillers for special purposes. The polyester-glass mat lamp shade material now coming on the market is generally produced in this way. In the past year, however, the possibilities of continuous contact pressure lamination have caused excitement in the industry.

The continuous lamination process is essentially a matter of running layers from one or more rolls of fabric and/or paper through a vat of resin, then through squeeze rolls where they go between a top and bottom layer of cellophane. The bottom layer is generally wider than the material being laminated.

Leaving the squeeze rolls, the assembly passes through a heating tunnel which is built around a textile tenter frame. The tenter frame grasps the cellophane on either side of the impregnated and laminated material and travels the assembly through a heating tunnel in gas-heated air, under infrared lamps or under electric heat (all zone-controlled) which acts to cure the resin to the point desired. The taut cellophane or treated paper acts as the pressure element in the process. Tunnel temperatures in most cases start at 180 and finish at 250° F., except for flexible resins which require heats up to 350° F.

At least one plant is experimenting with plasticized melamine coated or polyvinyl alcohol coated papers in place of cellophane as bottom carrier for some finishes. Some experimental work is also going on with stainless steel conveyors instead of the stretched cellophane *carrier*, but as yet no reports are available on the practicality of steel in this application. Rumors about still other methods of continuous laminating are many; but if such methods exist they are guarded secrets.

The product of continuous laminating

The product of this continuous laminating process is called a "skin." It is a thermoset material, composed of one or more layers of one or more materials. It usually runs from 0.016 to 0.16 in. thick, may be flexible as marquisette or stiff as thin steel, may be translucent or opaque, may be any color desired. If the filler is a decorative fabric, result will be decorative laminate.

[1] "Deep drawn laminates," MODERN PLASTICS, 23, 100–102 (March 1946).

If the filler is a fabric or the proper type of paper, it would be expected that the laminate would be postformable. However, to date, postformable continuous laminates are only in the development stage. But the qualities of the material, are not more important than the speed with which it can be produced. Material 1/16 in. thick, can be cured in continuous lamination at from 6 to 18 ft. per min., the rate depending on the resin, the filler, the machine and the men who are operating it.

As this article is being written, six continuous laminating plants are in operation, to some extent at least. They are operated by the U. S. Rubber Co., the Continental Can Co., Swedlow Plastics, Shellmar Products Co., Western Products, Inc., and Armstrong Plastic Co. Others are under construction. How much these plants are producing is the secret of their owners. One large machine, producing a laminate 80 in. wide at the top speed of 18 ft. per min., might turn out 57,600 sq. ft. in an 8-hr. day. This would be a very thin laminate and the speed is only theoretically possible.

Properties of a continuous laminate

Here is a list of properties of a typical cloth laminate consisting of one ply of printed cotton plus one ply of cotton duck, laminated with a polyester resin:

Taber abrasion resistance with 1000 g. load and 1000 revolutions of cs-17 wheel showed weight loss of 12 milligrams.

Moisture absorption after 12 hr. immersion was 3 percent.

Loss of weight on drying 24 hr. at 210° F. was 2 percent.

Laminate unaffected by heat from hot iron at 275° F. for 1 to 5 minutes.

Exposure to temperature of 500° F. produced small blisters and delamination.

Laminate unaffected by sodium hydroxide, laundry soap, trisodium phosphate, ammonia, alcohol, acetic acid, citric acid, mercurochrome, grease, mustard, ink, stencil, crayon marks.

Iodine produced a weak stain which was easily scrubbed off.

High- versus low-pressure

The chart on page 96 presents a broad comparison of high and contact pressure laminating methods and laminates. It will be referred to later in the discussion on markets. What does not appear on this chart is the advantage the high-pressure laminates enjoys through the existence of standards of materials and finished laminations. However, at one time, high-pressure laminates lacked standards too. But the chart does show that continuous and high-pressure laminates really complement each other for many uses.

Markets for low-pressure

We have covered the materials and methods used in low-pressure molding and laminating. Advantages of

WHERE IS THE LOW PRESSURE INDUSTRY GOING?

by PAUL R. HOFMANN*

At the recent S.P.I. Low Pressure Industries Division meeting in Chicago a member of the industry observed, "low pressure may not know it, but it is gradually becoming a part of the high pressure field!" The expression of this casual remark at a time of low ebb in low pressure represented in words the fears or hopes of the members of the industry.

Can low pressure exist on the strength of its record? Will high pressure fabricators adjust techniques in order to utilize low pressure resins? Are fields of application for the high and low pressure industries overlapping?

The importance of these and other questions becomes more marked each day as revised low pressure methods begin to approach in principle and by adaptation of equipment numerous proven high pressure techniques. A rapidly taken inventory shows low pressure in possession of a collection of obsolete techniques plus a number of unique operations, a wealth of knowledge of the versatile low pressure resins, a shattered vision of unlimited applications and the need for outlets.

It can be attributed to the activity of certain laminators, that the industry is alive today. Its existence is based on continuous laminating, deep drawn molding, preforming tehniques, procedures for making sandwich constructions, and one or two other innovations. It has borrowed for them not only from the high pressure plastics industry, but from the textile, plywood, hat, paper and metal industries as well.

The summation of the situation as quoted in the first paragraph has, therefore, a sound foundation of facts. It is further based upon the reasoning that low pressure must continue to borrow techniques from other industries to utilize its knowledge of materials and thereby exist.

Conversely, the use of new materials in old procedures, is of interest to those well informed in these procedures. Should products of this combination begin to appear as serious competitors in established outlets, then the gradual absorption of low pressure by those well informed in the old procedures becomes highly possible and low pressure work will pass from an industry to a technique.

The present condition calls for the adaptation of borrowed and new methods. Resulting products should fit into the general cost pattern. Field application should be carefully chosen and should be based upon the properties of the products, employing the adapted methods as means of obtaining and retaining in these products the exploitable properties of low pressure resins.

* Chairman, Standards Committee, Low Pressure Industries Div., Society of the Plastics Industry; and United States Plywood Corp.

WATCH THESE TRENDS IN LOW PRESSURE MOLDING

1. Movement away from competition with punch pressed postformed high-pressure laminates into sizes and shapes not possible with that method.

2. Increased use of deep-drawn polyester laminates in long run, fast run jobs, shaped in tooled or cast metal male and female dies, on compression presses.

3. Wider recognition that low-pressure materials are expensive but give products a high strength-weight ratio; an insistence upon their use for quality purposes rather than for price competition.

4. Less use of autoclave and rubber bags except for very large pieces—some of these large pieces to be made instead with resins curing at much lower temperatures and pressures.

5. Greater use of paper fillers, particularly with phenolic low-pressure resins in metal dies for large shaped pieces such as big radio cabinets and furniture.

6. Early development of standard polyester resins containing various combinations of base resins and other monomers to eliminate doctoring of resins in the molding plants. This will necessitate better engineering specifications on jobs being planned.

7. More study of the possibilities of low-pressure dielectric material with new synthetic fibers as fillers.

the molding processes outlined include the low cost of tools, low fixed capital in the plant, and flexibility of production as to size, shape and physical properties of moldings. Advantages of the low-pressure molded products are: chemical, heat and cold resistance; light weight; warmth to touch; resistance to corrosion; permanence of finish (provided the piece is made with a good die finish); resistance to abrasion and denting; tensile and shear strength.

Wonderful! What does it cost?

The materials are not cheap. Roughly, resins cost between 30 and 50 cents a pound, glass fabric from $1.49 to $5.01 a pound, glass mat 70 cents, cotton duck 80 cents, and printed fabric from 90 cents to $1.25 a pound. This matter of material costs is used as a red herring by competitors who drag it across the path of the men selling low-pressure products. The public and the distributive trades are, admittedly, asking for economical products; but they are also asking for better products–even when costs are higher! Provided the product is reasonably priced and its market good enough, cost factor is not too much of an impediment.

Bathroom scale housing

One product now planned for possible production in the not to distant future is a bathroom scale housing. The present scale housing is sheet steel stamping to which is glued a rubber mat, the whole output then being painted and, in places, plated.

Using a polyester low-pressure molding, a product will be made that will save 1½ lb. in shipping weight, have a pleasant chip-proof color and possess a rust-proof interior. The non-skid feature will be molded in, doing away with the rubber mat. But on a $5 or $6 scale, costs will be $1 per scale over that of the metal-housed product.

First joker in the deck is the fact that, to get similar production speed, a deep-drawn laminate method (as used in making the ice bucket mentioned earlier in this article) will have to be used and this will necessitate the use of dies just about as expensive as those used for stamping steel. Tolerances will have to be fairly close if the assembly is to balance and dial correctly

Comparing only the raw material costs of this scale housing with a steel job and considering that, volume for volume, 4 lb. of steel equals 1 lb. of plastic, we have the following:

4 lbs. steel @ 6¢ lb. = 24¢

½ lb. resin @ 40¢ = 20¢
½ lb. cotton @ 80¢ = 40¢
Total.....60¢

Without going into detail, the manufacturer's final cost for the part made by deep-drawn laminate method will be $1.12; the finished cost of a steel housing 60 cents.

The product could be made from formed or die-cast aluminum, or could be injection molded from a tough acetate material. In both cases the rubber mat would have to be applied. Aluminum, for the same quality of color finish, would cost more than the low-pressure molding. The injection molded piece would possibly have less strength, unless supported, but would cost rather less. Neither would rust or chip.

From the foregoing, the market position of the low-pressure molded scale can be determined. A million bathroom scales a year was the known prewar market. With nearly 40 million homes in the nation there should be markets for several models in different price ranges. Andover Kent Aviation Corp. may produce the housing for a manufacturer who wants a top-quality product at a slightly higher price.

Low-pressure cases

Suppose we carry the same idea into other fields—into cases for musical instruments, housings for portable radios, salesmen's kits. In all these cases the decision to use a low-pressure molded job will depend on the competition in cost of other materials than steel—and on the advantages offered by the plastic. Most of the competing materials will be more expensive than the steel of the bathroom scale, so the margin of preference in material costs will not be so great. If the markets are not so wide, possibly slower production on tools costing less than steel dies will be feasible. There will still be the important matter of tolerances for hinging

and fitting. There may be added to this the painting and finishing costs.

Strength-weight ratio will be a most important sales factor. Resistance to weather, impact, abrasion and dirt will be vital. But cost margins will be closer. However, in many instances such as the Lewyt Corp.'s new portable radio case, molding in of handles and some fittings will save assembly labor. This, added to the superior qualities of the low-pressure plastic, will compensate for a higher price.

Market for luggage

A known annual market for approximately $38,000,000 worth of luggage exists—about $16,000,000 for leather luggage and $22,000,000 for non-leather, such as covered fiber, bent plywood, etc. In the high-priced leather bracket, aluminum is beginning to compete as well as the laminates. Aluminum weighs about half as much as leather that is heavy enough to function well in this application. And low-pressure plastics weigh about half as much as aluminum. The plastic would have a slight advantage in scratch and dent resistance. The better the laminate for the purpose, the more filler it will have and the more expensive it will be.

One way of making molded-laminate luggage is to make 20 to 24 layups at a time, in a female mold (to get good outside finish), cover them with a rubber blanket, draw a vacuum and put them in an autoclave. But it takes 15 people or more to feed that autoclave—and the finishing after molding is considerable.

Bent plywood, weighing half as much as the laminate for the same rigidity, will cost about half as much—including a fabric covering with a vinyl or other scratch-resistant finish. In the low-price field, fiber covered with pyroxalin or other material carries a decided price advantage. Of course, to compete with bent plywood on a weight basis a core material, could be used such as cellular plastic or honeycomb, applying to it thin sheets of laminate. Here labor costs for four operations would make the job cost a lot more than a low-pressure molded piece and would put its cost much higher than the bent plywood price.

On the water

Another widely discussed field for low-pressure molding is boats—not the model toy boats such as the Noma Electric Co. produces[2], but big boats such as cruisers, sloops, dinghies, etc. Here three alternative low-pressure methods are possible. First, the job may be made of molded plywood; second, it may be made of two skin sheets, molded to a core material; third, it may be molded with strengthening ribs, using as filler either glass or fabric.

A survey made at the war's end showed a backlog of demand for $185,000,000 worth of new boats of all kinds from yachts to duck punts. There are roughly 3000 boat builders in the United States, but only a few of them distribute nationally. From a production standpoint, the best boat markets are in dinghies, small speed boats and sail boats. In these, light weight, standardization and low maintenance are all important.

The most economical method of making a dinghy, for example, would be from bent plywood. Molded plywood would be more costly and would weigh about the same. A sandwich structure boat would be still more expensive, but would be lighter. A molded fabric-or-glass-filled boat would be most expensive of all but would have an advantage in low weight. All would have to receive some finishing.

The secret of competition by low-pressure molders in the mass-produced boat market is in low weight, thin cross-sections and "beefing up" with molded-in ribs. Plus, of course, the cost of the method of cure. It does not depend on material costs alone.

Into this business as well as into others in the low-pressure field comes the high cost of an autoclave operation. Rubber bags and blankets are expensive and

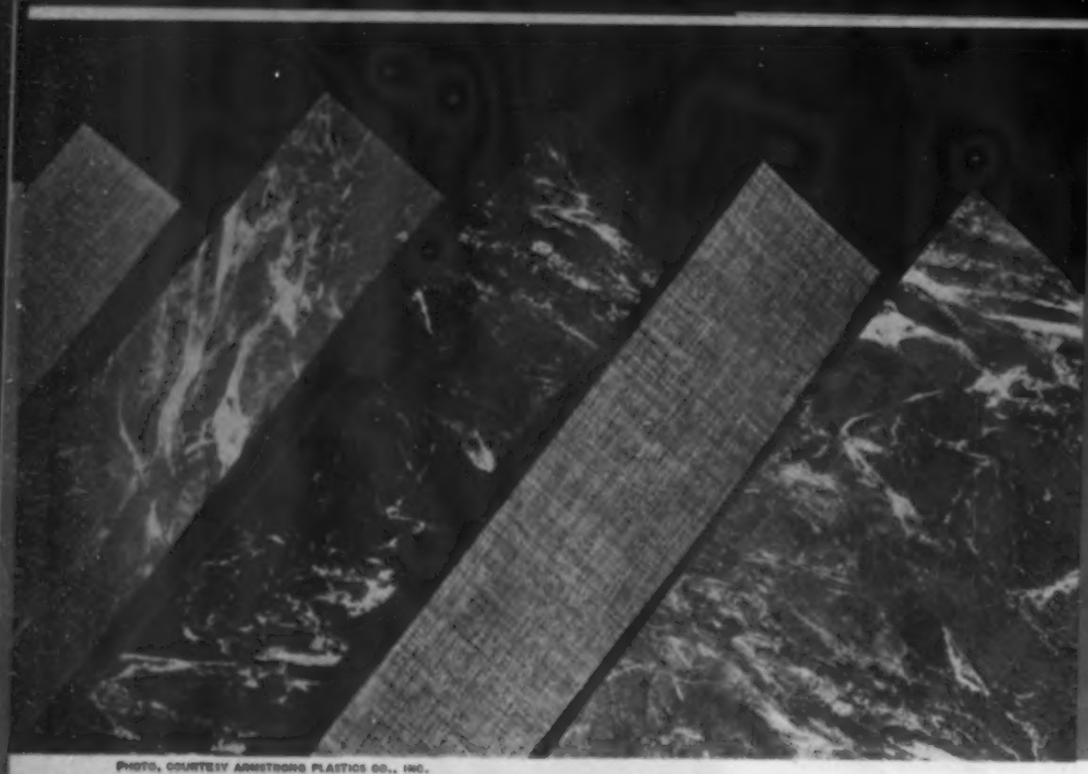
[2] "A new use for deep drawn laminates," Modern Plastics, 24, 110–112 (Feb. 1947).

Glass fiber mat and polyester resin, with a jute felt matting as core, comprise these trailer fenders which are produced on a compression-type press. A pressure of approximately 25 p.s.i. is employed; the cure takes 10 minutes

PHOTO, COURTESY KIT MANUFACTURING CO.







PHOTO, COURTESY ARMSTRONG PLASTICS CO., INC.

Using paper printed in marble or fabric designs with special inks, continuous laminators are able to produce highly resistant surfacing materials which may then be applied to plywood or other cores for use in table and counter surfacing, or for wall covering



PHOTO, COURTESY CONSOLIDATED WATER AND PAPER CO.

The size of the market for flat low-pressure products as flooring in trucks or trailers can be estimated from the 400 lb. of material used in this truck

under average shop conditions are good for not more than 20 times to the autoclave. Hand layup is an expensive procedure. The cost of applying pressure and heat in an autoclave is not less than the cost of similar operations in other devices. The cycles are slow. Where possible, on large pieces, there is a marked trend towards the use of resins which will cure under heats and pressures and which therefore, obviate the need for an autoclave.

Gar Wood Jr., son of the famous racing boat builder, is head of Wood Marine Engineering Co. which is going into production on a Fiberglas-plastic inboard-motor utility boat molded by low-pressure without the use of an autoclave. Weighing 600 lb. as compared with 1800 lb. for a conventional wooden boat of the same size, the 16½ ft. unit will carry six adults.

Wood's boat has a wall thickness of ⅛ in., but has bosses and ribs molded in. It is made in three pieces—the hull, the deck and the seat unit. All molds are female (for producing good outside finish) and are made of cast metal.

The polyester resin used is pigmented, putting final color in the main moldings. Then a special paint is applied for trim. Hull molding has an interior flange while deck molding has an exterior flange; where these flanges overlap, another formulation of the molding resin is applied and a metal strip of trim is snapped on, forming a perfect seal.

Mr. Wood is keeping his complete method secret for the time being, but he does state that a blanket plus air is used for pressure and that the resin cures at low temperatures. No autoclave is used. The boat is in the $1200 to $1500 range, at retail, which is about $1000 cheaper than a similar job hand-made of wood. But it is seamless and jointless. It needs no annual caulking; is impervious to worms. Boat experts who have seen it are enthusiastic about it. Naturally, its light weight has made possible the use of a lighter power plant (26 h.p.) to obtain speeds which are equal to those of great deal heavier boats that must use motors of twice the power.

Cruising car

Another good example of large moldings being made without an autoclave is the "Autoette" body, manufactured by Triangle Boat Co. for Blood Sales Co. This item is an electric cruising car for use in industrial plants and for personal travel in resorts. The original design called for an all-steel frame, but low-pressure molded plastics (glass fiber and Laminac polyester resin) proved both efficient and economical. The run

is in the low thousands, so inexpensive male molds were acceptable; and the product receives its final cure in the open air.

Trailer fenders

Another fairly large piece (a trailer fender) is made on a compression-type press by Parkhurst & Associates for Kit Manufacturing Co. It is made from Fiberglas mat and Laminac polyester resin, with jute felt matting as a core. The jute felt matting is sandwiched between two layers of the glass mat, placed between sheets of wire netting and impregnated in a dip tank. This filler is then rolled to reduce resin to the right proportion. The impregnated filler is laid up over a steel male mold and fitted to the mold by hand. The female mold lowers over the material and total pressure of 2400 lb. on the layup (about 25 p.s.i.) completes the cure in 10 minutes.

After cooling, the fender is flash trimmed on a band saw, automatically sanded and the edges hand filed. W. P. Fuller Co.'s laminate filler is then applied to the molding, followed by a coat of gray primer which is baked on in an oven. But the fender is still not considered as finished and after the aforementioned steps have been accomplished, the fender undergoes another inspection and a final finish.

This fender will not dent, bend, corrode or oxidize. It will stand up to the temperature ranges of a wartime product. It needs no braces nor struts for support. It is easily put on the trailer with a few bolts. Its raw material costs compare to those of steel in the ratio of 60 to 24 cents, and a 10 min. cycle in addition to quite a bit of hand finishing combine to make the job look expensive.

Stamping dies employed for this type of work have been estimated by an automotive authority to cost between $8000 and $10,000. In view of this economy, coupled with the limited market, the low-pressure molded plastic was cheaper for the purpose than stamped steel.

Street lamp globe

Aluminum male and female dies are used by Bassons Moulded Products to make the polyester-glass mat street lamp globe which is causing much excitement among civic purchasers[3]. The product can take pellets from an air rifle at 30 ft., can withstand the impact of sharp stones thrown by small boys, can take all kinds of weather in its stride; yet it has light refraction properties at least equal to those of translucent formed glass. Since a city of 2,000,000 people will spend $80,000 and more per year to replace broken street lamp globes, this product should have a worthwhile market. In production, it will be a long run and a fast run job, made to very exact specifications. The dies will naturally be expensive. In order to turn out finished products of this type they must, of necessity, be well tooled and, in addition, able to withstand considerable heat and pressure.

[3] "Laminators see volume outlets ahead," Modern Plastics, 24, 95 (Jan. 1947).

Future markets

There'll be plenty of markets in due time for the low-pressure molded plastics. But the best of those markets will not necessarily be those so widely discussed in the industry today. And they are not likely to be markets in which price is more important than strength-weight qualities, impact resistance, abrasion, chemical, moisture and heat resistance. Indeed, the best of the future markets will probably be in entirely new products available in these wonderful materials alone.

What can happen with paper in the low-pressure field is anybody's guess. Experiments are going on in the molding of large radio cabinets from low-pressure phenolic impregnated paper, the top layer of the layout being paper printed to simulate wood. Here, again, the dies and molds will in all probability have to be highly finished strong metal to eliminate extra finishing of the final product. This material and this method will make possible low-pressure molding of large cabinets and possibly some furniture[4].

Markets for continuous laminates

Magic words in the plastics industry in 1946 were continuous laminates. The process, described earlier

[4] An example is the formable decorative paper laminate made by Briggs Mfg. Co. which was discussed in "Laminates take over interior paneling in postwar automobile," Modern Plastics, 24, 112–118 (Jan. 1947).

WATCH THESE TRENDS IN CONTINUOUS LAMINATING

1. Less emphasis on competition with high-pressure laminates. More emphasis on competition with translucent glass, coated fabrics, light metals, thermoplastic sheet, wood.

2. Early development of postformable paper-filled continuous laminates will open new markets.

3. Development of dense polyester coatings on paper and fabric so that this thermosetting material will compete in wall covering and drapery fields.

4. Movement toward development of completely new types of products instead of conversion of old products from other materials.

5. More experimental work on translucent polyester laminates in the lighting field.

6. New experimental work on casting sheet polyesters without fillers on continuous machines.

7. Wider application of the more flexible continuous laminates. New combinations of fillers in all laminates.

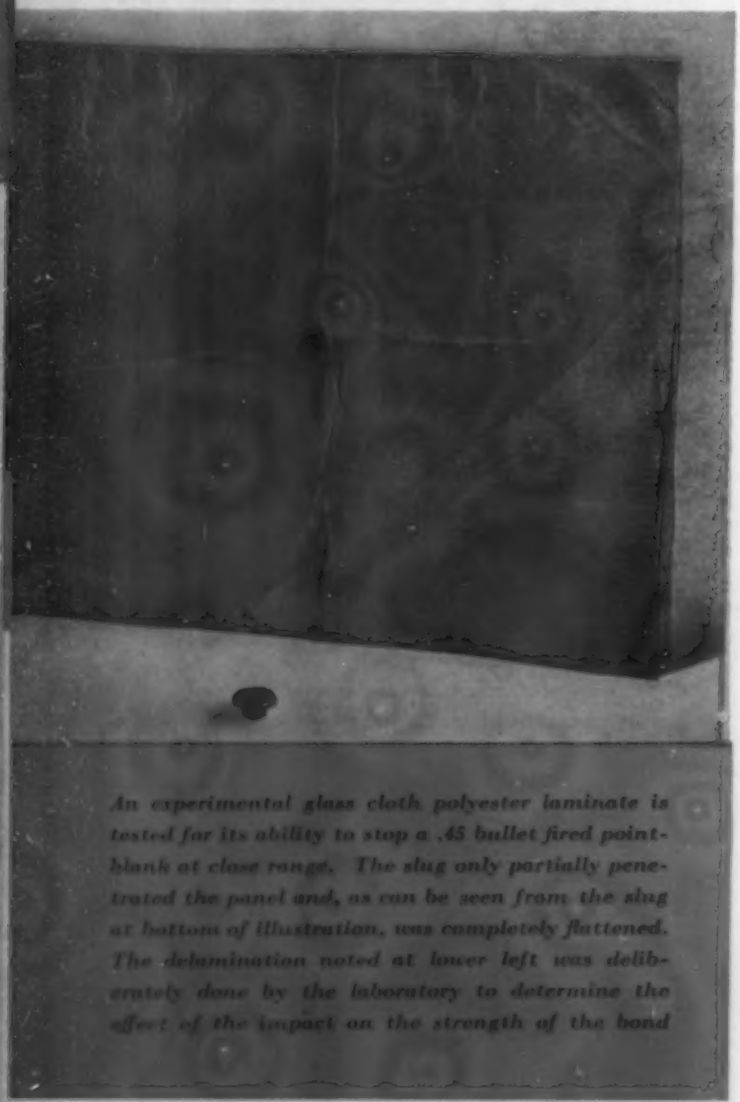
8. Use of "coupling agents" in laminating papers to obtain better wetting of cellulose fibers by polyester resins with resultant lowering in moisture absorption.

9. Continuous roll gluing of laminates to core materials for applications such as card-table tops, wall panels.

in this article, has been promoted as promising to do for plastics what the endless sheet rolling process did for steel. It has also been pooh-poohed by some as being a piece of false economy.

One of the major false premises about this material—a premise attributable to loose talk in the industry—is that it is designed to compete directly with the high-pressure laminate. The absurdity of this is obvious from a study of the chart on page 96. Instead of competing with high-pressure laminates, the contact laminates will be quite likely to complement them in the markets.

In the manufacture of table tops, for example, the contact pressure or continuous laminate can be applied to a soft core, such as fir plywood. The high-pressure laminate, on the other hand, generally requires a hardwood core. However, the contact laminate, unless carefully applied, stands a chance of "telegraphing" the grain. It may be that abrasion and impact resistance equal to the better metals or the high-pressure laminates will not be necessary in a wide segment of the table top and kitchen work surface market and that lower cost polyester laminates will find a good outlet here. This table top field is the only one in which continuous laminates will be competing directly with the high-pressure products. And in this market for many years to come there will be room for both!



An experimental glass cloth polyester laminate is tested for its ability to stop a .45 bullet fired point-blank at close range. The slug only partially penetrated the panel and, as can be seen from the slug at bottom of illustration, was completely flattened. The delamination noted at lower left was deliberately done by the laboratory to determine the effect of the impact on the strength of the bond

Continuous laminate applications now ready for market are decorative venetian blinds, fluorescent lighting shields and airplane structural panels (which may readily be carried into domestic use as partition material). It is unlikely that continuous laminate wall surfacings can compete with vinyl or acetate coated papers, but in some wall applications the thermosetting qualities of the laminate are no doubt favored. Provided the whole building regulation picture changes within the next few months to permit the use of new materials, there could be a very good home building market for continuous laminates as panel surfacings over light weight cores. However, cores cheaper than any now on the market would first have to be developed.

As we said before, postformed applications of the polyester skins are apparently still experimental. This represents another big "if" in the picture. If a paper-filled continuous contact laminate with superior post-forming qualities can be developed, applications waiting for it will make a market amounting to millions of pounds or millions of square feet.

Another "if" is this: if a means is developed whereby a dense coating rather than surface impregnation can be had, the continuous laminate, being thermosetting, will compete with vinyls and other thermoplastic materials as well as with light metals for innumerable uses, but especially for wall decoration, packaging and drapery uses.

The field is young. The enthusiasm of its promoters is enormous. The research being conducted into the stabilization of standards for resins and fillers is continuous and rapid. By the time this article is printed some of the problems of this new segment of the industry will be solved. Two years from now many more will have been solved.

Acknowledgments

The Editors extend thanks to the following for their cooperation in the preparation of this article: W. C. Davis, J. R. Marshall, Wm. H. MacHale of American Cyanamid Co.; C. W. Armstrong of Armstrong Plastics Co., Inc.; Donald Masson and John Stokes of Bakelite Corp.; Richard M. Lane of Continental Can Co.; Robert Brinkema of Egmont Arens Organization; Louis Francisco of Formica Insulation Co.; William Haylon and A. E. Wiles of General Electric Co.; James Zack, R. W. Crawford and C. L. Jones, Jr., of Monsanto Chemical Co.; Clare Bacon of Owens-Corning Fiberglas Corp.; Arthur Draper of Remington Rand, Inc.; Robert G. Goodale, Resinous Products & Chemical Co., Philadelphia, Pa.; William Darling of Riegel Paper Corp.; David Swedlow of Swedlow Plastics Co.; Paul R. Hofmann of United States Plywood Corp.; L. S. Meyer of Western Products, Inc.; Gar Wood Jr. of Wood Marine Engineering Co. and James W. Greig of Woodall Industries, Inc.





One size container is made to serve all sizes of collets through use of paperboard sleeves slipped over collets to take up extra space

Visibility and versatility in one package

The transparent molded styrene cover displays the product; the phenolic base lends protection

WHETHER to employ a blind type of package and rely upon adequate labeling to identify the contents or to utilize transparency in such a manner that the packaged item *speaks for itself* constitutes a problem that has confronted a great many companies at one time or another. The decision usually depends upon the relative degree of product protection that is needed, the special merchandising considerations relating to the product in question and the permanence that is desired in the package.

The unique plastic package that the South Bend Lathe Works, South Bend, Ind., developed for its line of collets, which are cylindrical metal parts used to hold a tool or piece of stock during machine operations, is the outgrowth of just such indecision and subsequent considered study of all related packaging and merchandising factors. A package was needed which would, at one and the same time, provide adequate protection for the collets and facilitate their handling and display by dealers. The collets are made in four sizes and several different styles to meet a wide range of machining requirements. The firm's previous practice had been to package the collets in labeled paperboard cartons. These boxes were made just large enough to hold a single collet, an arrangement that made it necessary to stock four different sizes.

As finally developed, the new plastic package consists of a two-piece plastic container, the base being square in cross-section except that corners are tapered off, giving the edges an attractive ribbed design as illustrated in the above photographs. The base, compression molded of brown general-purpose Textolite phenolic, has a cylindrical inner surface and is capped by a clear polystyrene threaded top which engages threads in the lower section. A 4-cavity mold is used by the General Electric Co. at its Fort Wayne, Ind., plant for the molding of the base; the cap is produced by the Plastics Div., General American Transportation Corp., and also by the Taunton, Mass., plant of General Electric Co.

The packages are placed on their sides on the dealer's shelves, in order that the size and style of the collets may be clearly observed through the transparent plastic tops. The flat sides of the packages prevent them from rolling and facilitate orderly stacking; the sturdy construction and convenience of the packages add greatly to the re-use value in the plant.

Naturally, the matter of cost had to be considered in connection with the new packages. Had a container of different size been designed for each size of collet, mold costs might have proved prohibitive. But this problem was neatly solved by using the same container for all four collet sizes, and employing simple paperboard sleeves to take up extra space around smaller collets.

CANADA DEVELOPS A NEW FORM OF LIGNIN

by N. B. POWTER*

Low-cost resin, extracted from paper mill waste, is moldable, has low melting point, lends itself to varied applications



Plain and mottled wall board made of paper-base laminate which utilizes lignin modified with phenolic resins

TO THE ever expanding list of resins and laminates there now can be added a new form of lignin and a paper-base laminate utilizing lignin, or lignin modified with phenolic, for the plastic binder. The use of lignin is not, of course, new to the plastic industry. What is new is the availability, at long last, of a low melting point, moldable and workable form of lignin. This material has already proved its merit in a phenolic-lignin enriched, paper-base laminate now being marketed in Canada under the name Arborite. Also, sample shipments of the lignin powder, Tomlinite, have been sent to various industries to explore its usefulness.

Nature, the master chemist, utilizes lignin as a plastic cement to bind the fibers of wood together, but like many other natural products, it is an exceedingly complex material with an undetermined chemical structure and with reactions which are mostly unpredictable. This, coupled with the fact that the usual methods of extraction cause it to undergo more or less major change, has heretofore limited its application. Since it would be obviously uneconomic to utilize wood solely for its lignin content, we must of necessity look to the chemical wood pulp mills for our source material. Here we find that wood is reduced to fibers by chemicals which dissolve the lignin. The fibers are saved for pulp making, but the lignin, sugars, etc., are for the most part either run to waste, or burned for their fuel value in a chemical recovery system.

* Howard Smith Paper Mills Ltd., Montreal, Canada.

So far, little or no use has been found in the plastics industry for the lignin contained in the waste liquor of the sulfite method of pulp-making. On the other hand, several attempts at lignin isolation have been successful with the waste liquor of the alkaline (soda or kraft) pulp-making system. The requirements are that the liquor be evaporated to a reasonable solids content and then acidified. There are numerous ways of doing this but the quality of the finished product and the cost of the process depend on the acid used, the speed of reaction and the prevention of oxidation of the lignin.

Processing the lignin

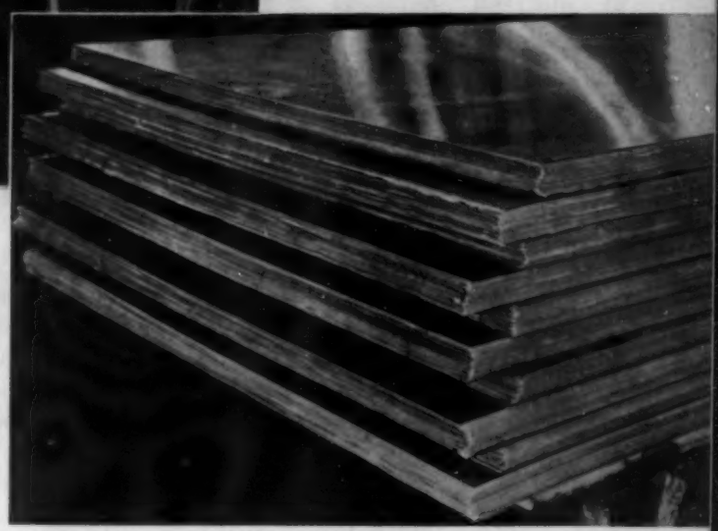
These problems have been solved neatly in the new process by using carbonic acid (CO_2) gas as the primary acidifying agent, large quantities being available in the flue gas of the pulp mill. The speed of reaction has been increased over older methods (which bubbled the CO_2 through the liquor) by spraying the liquor in small droplets against a rising column of CO_2. Because lignin oxidizes less rapidly than the CO_2 acidifies it, the oxygen pick-up is negligible.

At this point the lignin is in the form of small divided particles of acid lignin salt, but upon heating, it melts into a viscous liquid which is readily separated from the aqueous black liquor by continuous decantation. From the decanter it passes to a tank where it is dissolved in hot water, then acidified with sulfuric acid to yield a water-insoluble precipitate with a particle



Left—A tan colored lignin, mounted on a plywood core, forms these table tops in a Canadian restaurant. The tops are easily, quickly cleaned and can be made practically scratch-resistant

Below—The paper base of the laminate contains about 40 percent of lignin resin. The paper is surfaced with a 10 percent coating of phenolic. If necessary, a melamine sheet is added for further surface hardness



PHOTOS, COURTESY HOWARD SMITH PAPER MILLS LTD.

size of from 2 to 15 microns. This is readily filtered on a continuous rotary filter and comes off as a thick amorphous paste which breaks down into a fine brown powder on passing through a suitable dryer.

Development started in 1942

The process is a development of the research department of Howard Smith Paper Mills Ltd. and stems from some of the original work undertaken by the G. H. Tomlinsons, Senior and Junior, over the past 25 years.

Intensive work on lignin recovery from alkaline pulp mill liquors began early in 1942 as a result of discussions with the Canadian Department of Munitions and Supply which was then greatly concerned over the shortage of plastic resins. In a remarkably short time the laboratory devised the new process which gave a relatively pure and low melting-point material. The work was then transferred to the experimental paper machine at the U. S. Forest Products Laboratory, where its staff, together with representatives of the Canadian Forest Products Laboratory and Howard Smith Paper Mills Ltd. laminated and tested some 37 different runs of lignin-enriched paper. This led to the construction of a pilot plant for the recovery of lignin in commercial quantities and its subsequent conversion to a laminate in a 10 deck, 4 by 8 ft. laminating press. Early in 1945 the plant came into operation and continuous production has been maintained.

As a fuel, lignin may be valued at some three to four dollars a ton. Every kraft pulp mill in the world burns it as such when reclaiming the digesting chemicals

Below—Laminate layups, with melamine impregnated top sheets, are put between caul plates, loaded in press



(soda and salt cake), but with this new process the pulp mills can transform their waste liquor into a substance worth many times its fuel value. At the same time the plastics industry will be assured of a constant source of a low-cost resin to be used alone or in conjunction with others of the thermoplastic or thermosetting types. As currently produced, this new lignin, Tomlinite, has a melting point of about 170° C.

Use in laminates

To date, its primary use has been for the manufacture of Arborite, a paper-base laminate, currently marketed in Canada for use as a table top material, a 1/8-in. thick decorative wall board, doors and other construction in bathrooms and as a substitute for ceramic tile in public rooms of hotels, restaurants, bars and soda fountains. Decorative Arborite has been used extensively in marine work as a wall paneling for cabins. As a table top material, in some cases a 1/8 or 1/16-in. thick sheet has been mounted on a plywood core; in others, 3/4-in. stock is mounted directly on the metal stands. It is in this last type of application that the relatively low cost of the resin-impregnated paper proves an advantage, as prices would be prohibitive for the thick sections if high-cost resins and after-impregnation had to be employed.

In the electrical field the laminate has proved to be an efficient dielectric and is available in any thickness from 1/16 to 1 1/4 in. with the usual commercial surface requirement. The thinner sections are used for electrical barriers or housings for bus bars, connections or switches, and may be made into a waterproof, non-conducting conduit. The thicker sheets make excellent switch, fuse or relay panels or blocks. In addition to its dielectric and strength properties, Arborite may be cut, drilled or shaped according to requirements.

Basically these products are all made from a lignin-enriched paper containing some 40 percent of the lignin powder. The paper is made on a conventional paper machine from pulp enriched with the resin in the beater, thus eliminating the slow and expensive process of impregnation heretofore necessary with paper base laminates.

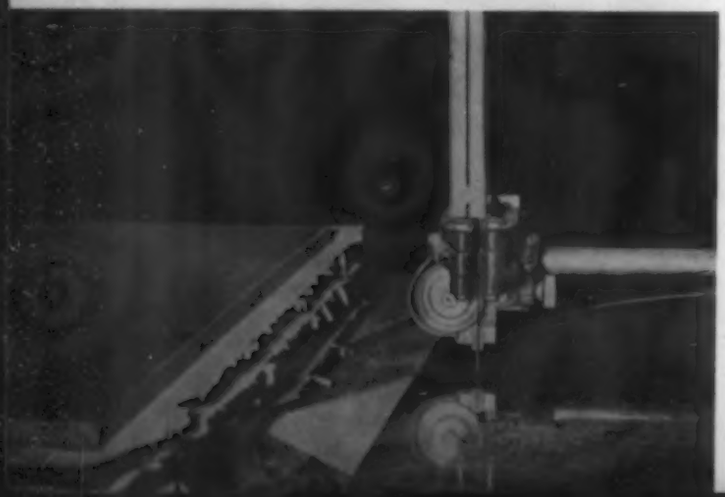
Lamination is carried out in the usual multiple hot laminating press. Bundles of the paper are placed between caul plates, inserted in the press and subjected to a pressure of some 800 p.s.i. at a temperature of 170 to 180° C. On completion of the cook or cure, the press is cooled and the cauls stripped from the finished laminate. Finishing operations include circular saw cutting to size, beveling, round-cornering and edge finishing with wet sander and buffer.

The natural color of the laminate is a deep walnut brown and for decorative purposes a paper surface sheet to which a design has been applied is usually employed and the whole impregnated with a melamine resin. For extra scratch-proofing a transparent melamine-impregnated cover sheet is added. It might be mentioned here that because of the relatively low curing temperature (150–160° C.) of the melamine impregnated sheets, it was found necessary when making this class of product to plasticize the lignin molding paper with a phenolic resin, applied at the size press of the paper machine to the extent of about 10 percent. Further improvements in the manufacture of the lignin and the molding paper may obviate the need for the higher priced phenolic resin.

Properties of lignin laminate

The most significant properties of Arborite are its structural stability under widely varying temperature and atmospheric conditions, its excellent machinability and its extraordinary toughness when compared with other paper base laminates. Like other laminates surfaced with melamine it is stain-proof and resistant to moisture, heat, alcohol, solvents and mild acids and alkalies. Its water absorption is also desirably low and its strength characteristics are satisfactory as indicated in Table I.

Developments are under way which it is hoped will lead to an improved product with even lower melting point and greater moldability. Should its use as a constituent of molding powders be proved and should it find favor with rubber manufacturers in place of carbon black and in a number of other unrelated industries, mass production can be counted upon to make it available at very low cost.



Band saws are used when it is necessary to cut round or irregularly shaped edges on finished lignin board

Table I—Properties of Normal Lignin Core Stock (1/8-in. thickness)

Water absorption, 24 hr., percent	1.05
Impact strength, Izod	
Lengthwise, ft.-lb./in.	5.10
Crosswise, ft.-lb./in.	3.97
Flexural strength,	
Lengthwise, p.s.i.	22,400
Crosswise, p.s.i.	18,500
Tensile strength	
Lengthwise, p.s.i.	19,000
Dielectric properties	Similar to other paper-base laminates

Merchandising of vinyl sheeting

WITH increasing frequency, business news features the entry into the plastics industry of companies who built sound reputations in other fields, related or not. The impact of such events on the production of plastic products can be easily estimated but the changes they bring to the merchandising of plastics materials and products will generally only become apparent after they have been in the plastics field for some time. It is not always possible for such companies to carry into plastics the same labeling, sales training and other merchandising policies that they have used in connection with their other products, but where it is possible, the application of wide past experience in other fields should be of some advantage to the plastics industry as a whole.

O'Sullivan Rubber Corporation, Winchester, Va., which has manufactured and merchandised rubber heels and soles for 50 years has decided to manufacture vinyl sheet material, both unsupported and fabric backed for sale to the shoe, handbag, furniture and related fields immediately, and for wide application later on. The company does not contemplate the manufacture of any raw materials, but will draw upon existing sources for resins and plasticizers, etc. Their entire technical laboratory personnel will concentrate on the formulation and development of their line of products. They propose to service their customers through technical sales personnel to assure the proper application of their materials.

The president of O'Sullivan Rubber Corporation, Earl Bunting, is president of the National Association of Manufacturers, an industrial engineer of note and an experienced merchandiser. Mr. Bunting proposes to apply to O'Sullivan's plastic operations the same merchandising principles that have been employed to maintain the respect and loyalty of its customers for fifty years. O'Sullivan proposes, in short, to guarantee its materials to the consumer.

This policy was adopted after thorough investigation of the problems involved in controlling applications. Mr. Bunting recognizes the necessity of technically trained sales personnel to assure proper application of plastics, formulated and designed to meet specific end product requirements. He further recognizes the obvious necessity of product identification under such a program. O'Sullivan intends, through its guarantee, to make it worthwhile for the fabricator of its material to cooperate fully with the program. Every effort will be made to provide pre-acceptance of merchandise fabricated from O'Sullivan "Pedigreed Plastics" by the retailer and the consumer; thus, the fabricators' merchandising problems will be greatly simplified.

O'Sullivan will start with the shoe field, in which it has had 50 years experience. Currently, methods are being developed in shoe factories, as well as in the company's own research laboratory, for the production of cemented shoes with vinyl uppers. This research covers not only improved methods of fabrication from the standpoints of speed, cost and quality, but emphasizes also functional design and styling. Design is being tackled from the standpoint of reducing the hand labor factor in shoe production. Problems here involve the use of plasticizers which will not migrate to the cement, the development of material with high tear-strength and good flex fatigue properties. Once the materials and methods have been proven, O'Sullivan's technical staff will supervise instruction in the plants of all shoe manufacturers using its "Pedigreed Plastics."

Every piece of material going out of O'Sullivan's new plant will have the name and trademark printed on its back; and where transparent or translucent film is produced, name and trademark will be reproduced on the selvage. Any manufacturer using this material will have his product tested by an independent laboratory and then will be supplied with informative labels carrying O'Sullivan's guarantee to the consumer.

The application of plastic sheetings in other fields will be approached in a similar manner to the procedure followed in developing a plastic shoe upper material. This comprises the tailoring of the plastic to fit the use, development of satisfactory application techniques, promotion of the product through industrial outlets and evaluation of the end product for the consumer's protection. O'Sullivan intends to develop specialized materials for each field, believing that only in this way can its guarantee be maintained on such a comprehensive basis. The initial plant operation now being set up involves a capital expense of over a million dollars.

In an interview with MODERN PLASTICS, Mr. Bunting stated, "This company feels that in adopting these principles, it has a three-way responsibility. It is responsible, first, to itself and to the respect in which its name has been held for 50 years. Its second responsibility is to the public—the only boss it has ever had. Its third responsibility is to the plastics industry, to which it intends to make a worthy contribution."



Two plastic materials are used in this car—cellulose acetate for body, windshield and tail lamps; cast phenolic for headlights

PLASTICS and metal make a sturdy

THOSE who contend that many of the soundest applications of plastics lie in their proper combination with other materials might well cite the example of the new Steer-o-Toy, a 13-in. model roadster in which an injection molded cellulose acetate body is combined with chrome-plated metal parts to produce a striking toy with sweeping lines in harmony with the latest design trends in full-sized motor cars.

A model for driving instruction, the mechanical feature of the toy is a patented steering mechanism that automatically turns the front wheels in either direction simply by tilting the body slightly as the car is pushed along the floor, table or other smooth surface. So realistic is the manner in which the car can be maneuvered, backed, parked, etc., that police departments are utilizing some of the models for driver instruction.

The Elmer E. Mills Corp., Chicago, Ill., is molding the streamlined body of the car in Lumarith and Tenite, the present color range including red, green and yellow models. The body molding, weighing approximately 12 oz., is produced in a single-cavity die on a 22-oz. Reed-Prentice injection press. Subsequent assembly operations on the car are done by Steer-o-Toys, Inc., also of Chicago.

Plastic components on the model include the curved one-piece clear acetate windshield, which is molded in a single-cavity die and cemented into a slot in the cowl section, and the Catalin headlight lenses and acetate tail lamps, which are both fabricated by Colonial Kolonite Co., Chicago.

Metal components

The luxurious appointments of the Steer-o-Toy, which was designed by Ira L. Yarbrough, strike a distinctive note in quality toys. Standard equipment includes such features as molded rubber seats, chrome-plated front and rear bumpers in the latest "wrap around" design, chrome headlight and tail light rims, realistic tires of non-marking synthetic rubber, and metal disk wheels with white enameled sidewalls and tubular brass sleeve bearings. The car stands $3\frac{1}{2}$ in. high overall and is $5\frac{1}{2}$ in. wide.

Details of body construction

Designed to absorb plenty of rough punishment when the car is whisked across the floor by enthusiastic young drivers, the acetate body has a wall thickness of $\frac{1}{8}$ in., giving the car a solid heft and providing a secure foundation for the running gear, bumpers and other parts. Heavy, cored bosses for anchorage of the front and rear wheel assemblies are molded into the underside of the body. The heavy metal bumpers are secured to the body by means of thread cutting screws which are inserted through holes drilled in the molding at both the front and the rear.

As an added service to our readers, MODERN PLASTICS has enlarged its editorial content and extended it throughout the back pages of the magazine. Among the features to be found in this new section this month are: a report on the recent flammability hearing in Washington on page 182; an article on furfural as a new base for nylon on page 222; a digest of the speeches delivered at the Canadian S.P.I. meeting, presented on page 178; and the production figures on plastics and synthetic resins, a monthly feature, appearing on page 234.

The die-cast, fixed steering wheel and post assembly, threaded on the lower end, is inserted through the opening drilled below the dashboard and secured by a hex nut on the under side. Head and tail light lenses are flanged so that they lock the metal rims in position when lights are mounted through holes in the body, while tail lights are cemented in position.

Although the body molding contains no unusual undercuts, it is interesting from the standpoint of the deep, delicate cores employed to maintain consistent wall thickness. Typical of the attention to detail in this piece are the fine lines on each side of the body which represent the joint between door and body panel. It would have been simple to substitute a fine rib for these grooves merely by engraving a shallow line in the die at the four points. However, it was decided that the model merited more realistic treatment, with the result that painstaking work on the mold was necessary to obtain the desired effect.

toy roadster

Assembly operations

Mechanical parts of the car are of $1/16$-in. heavy sheet stock, with rivet construction. Assembly operations include cementing the rubber seats in place, bolting the bumpers and steering column in position, installing head and tail lights, and fastening the spring-balanced front and rear wheel assemblies to the body at three points with Phillips-head thread cutting screws.

The illustrations on these two pages show the fully assembled car and the complete set of parts that are used in the assembly. The picture of the underside of the molded cellulose acetate body gives emphasis to what has been said about the care taken in the designing of the model roadster. In the explosion view of the various parts that go to make up this toy, an attempt has been made to arrange the components in relation to each other and to their final position on car body.



Left—The underside of the car body reveals the sturdiness of the cellulose acetate part. The heavy cored bosses provide anchorage for the wheel assemblies and the thick walls will support running gear, bumpers, etc.



Right—An explosion view of the roadster shows the numerous parts of which it is composed. Components are arranged in relation to each other and position on car



ALL PHOTOS. COURTESY DOUGLAS AIRCRAFT CO.

Left—This thermoplastic resin and ceramic material is finding wide use as a preservative coating for plaster cast molds, permitting their storage out-of-doors. In some applications, these casts are first covered with burlap bags; then the resin mixture is applied with a paint brush



Right—In solid form this plastic material can be used for drill jig forms (such as shown here) for dies and fixtures. In this form it was widely used during the war in the production of airplane parts

A preservative coating that developed

A PLASTIC developed during the war for use in cast jigs and fixtures has been converted into a tough, economical protective coating for plaster-cast molds. The material is Plastiform,[1] a blend of plasticized synthetic and inorganic thermoplastics with mineral fillers. The new usage was developed by the Douglas Aircraft Co. to protect molds of important airplane parts in open storage at its plant located at El Segundo, Calif.

The casts, though bulky, must be handled carefully. They represent thousands of man-hours in work and design. Some of them are the piece-by-piece designs of the big Douglas workhorse-of-the-air, the DC3. Rather than erect wood frames for their protection, plant engineers suggested painting the casts with Plastiform, and storing them in an open field.

The coating process

The coating process itself is simple and inexpensive. The plastic comes to the company in chunks which resemble gray shale rock. Heated in a tin container, the material becomes a thick gray paint which any inexperienced hand can apply to the design portion of the cast with an ordinary paint brush. At first the plastic adhered too readily to the sanded-down finished surface. To make the coating removable, the plastic cast was coated with a preliminary coat of viscosity oil.

The first cast treated in this manner was tested with heat, cold, steam, water, salt and acid and then was put out in the open and subjected to natural weathering. The part is still intact.

Economics of coating

When the war ended, it was decided that plaster casts of all Douglas plane parts should be given the same treatment. Without Plastiform, the 7500 plaster parts would have required a warehouse almost as large as the plant itself. The alternative was to use plywood boxes for each cast, but plywood was expensive, hard to get and entailed considerable labor costs for box construction. Some form of protection was essential. A plaster cast for aircraft may be worth $900 or $1000. If left unprotected and allowed to deteriorate, damage

[1] Product of Calresin Corp., Culver City, Calif.

would range from 10 to 100 percent. The $2.00 spent on coating the plaster piece is negligable compared to the value of the casts preserved from damage or total destruction.

In addition, the plastic material is 100 percent reclaimable. If Douglas Aircraft suddenly found it necessary to use every one of the designs under the plastic hoods, one man armed with a scraper and an air hose could quickly lift every one of those protective coats. A slight chipping away of a piece of the coat and a spurt of air frees the coating.

Since the plastic was introduced, several refinements have been added. It was found that cup grease, instead of lube oil, works best as a treatment for rough cast surfaces. Exceptionally large surfaces, like wing tips, hold the coating a great deal better if it is applied over gunny sacks. Such an application is shown in the illustration at the top of the preceding page.

Making jigs and fixtures

For the fabrication of jigs, dies and fixtures—the original use for this material—Plastiform is utilized in two different procedures. If the master check die or fixture is made of plaster, the plaster is coated with a light lubricating oil simply by painting the surface with a paint brush. The Plastiform is then applied to the plaster surface with a paint brush and built up to a thickness of from $1/4$ to $1/2$ inch. The remainder of the cavity or backing is then made of either plaster and hemp, or phenolic resin which has been compounded with 30 to 40 percent of acid-washed asbestos. If this phenolic resin mixture is used, it is necessary to cure from 1 to 4 hr., depending on the mass in the oven at 150° F. When plaster is used, it naturally sets at atmospheric temperatures. A procedure also employed when using plaster masters is to dike up the side of the plaster master and slush cast Plastiform rather than brush it on with a paint brush.

The second procedure is to take a hammered skin or the section to which the fixture is to be made, place it in the holding or, the drilling cradle, paint the surface of this skin with Plastiform and then back it with plaster and hemp or with the plastic and asbestos combination. The method to be used for backing is described above.

This cradle arrangement is superior to the plaster since the cradle is drilled with drill bushings placed within and, when it is made to conform to the actual section to be drilled or routed or checked, it follows the exact dimensions—Plastiform having a shrinkage of only 0.005 in. in 3 feet.

from cast fixtures

This combination thermoplastic resin and ceramic material was used in solid form during the war for route-drill jig forms. As a preservative, its prime reconversion use, it is melted down and applied with a brush to die portions of plaster casts. Thus coated, the casts can be stored out-of-doors without further protection. This procedure does away with the expense of constructing storage racks to hold the casts above ground.





Below, left—The coating may be applied with an ordinary paint brush. In this type application the coat is about 1/16 in. thick and is easily removed with a scraper and air hose. Below, right—Protection given by coating is evident if uncoated top is compared to coated front surface

PLASTICS





Here is the solution to many a knotty problem. Acetate or celluloid bases of these Kno-Knots come in cast form and in a variety of colors. They are shaped by applying heat, then hand cut in various designs. The clips shown here are die punched. Other Kno-Knots are metal plated electronically in copper, gold or silver and hand polished. Artlee Products Co. is the manufacturer. For convenience in sewing to suit or purse there are two holes in each of the plastic bases

Addresses of companies mentioned appear on page 225



Women's hair brushes, men's military and club style of brushes, recently brought on the market by the Empire Brush Co., feature bristles of extruded Vinylite monofilaments. Because the vinyl bristles do not absorb moisture, they do not become soft and soggy. Since the plastic is highly resistant to acids, these bristles can be used in industrial brushes

PRODUCTS



This Remindex is equally at home for marketing lists and business appointments. Art Plastics Mfg. Co. injection molds the case of both Tenite I and II, and also does the polishing and assembly. Available in a variety of attractive color combinations to appeal to the housewares as well as to the stationery and advertising trades, the Remindex has a handy pencil holder and a 250-ft. paper roll which allows endless notes



Forming a tight seal and eliminating the nuisance of untidily leaking powder, Geon plastic plays a small but very important role in these handsome compacts manufactured by the Evans Case Company. The vinyl chloride, which is extremely durable, is molded around the outer edge of the powder sifter. Additional attractions of this new sifter are its ability to retain its shape and to gain much-needed space by flattening down

Taking its form from the arty set—this compartmented food tray is made in the shape of an artist's palette. American Injection Molders, Inc. mold the tray of durable Celcon using 2-cavity dies. Merchandised 4-to-the-set, these trays are available in amber, blue, red and green or in red, green, blue and yellow. Because the ethyl cellulose is odorless as well as tasteless, food may be served directly on the tray



The handbag industry is taking full advantage, in its spring lines, of the detail that can be achieved in molded Lucite frames. And it is making greater use of acrylic in these bags. Take as examples these frames molded by the McDonald Mfg. Co.

PLASTICS



A saving in weight and bulk was achieved when Durez (sample, left) was substituted for wood (sample, right) for housing of this U-Reely control for model planes. Remler Co., Ltd., molds housing for the American Junior Aircraft Co.

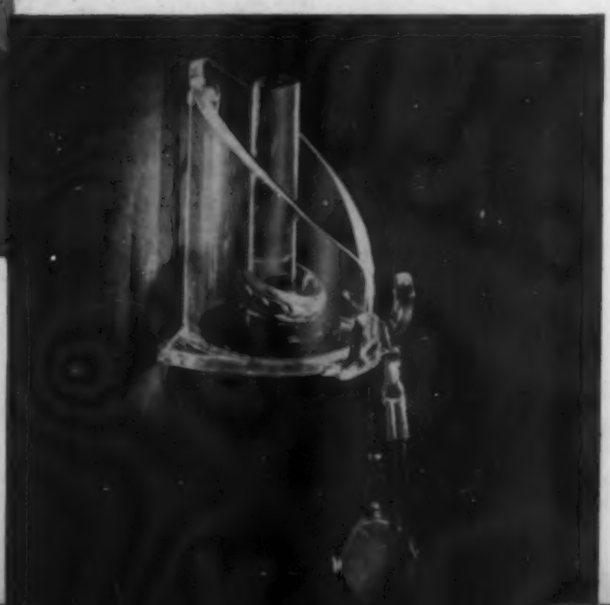


Good colorability and low cost explain the use of polystyrene for this two-piece candy box which is molded by the Plastics Div., General American Transportation Corp., for Mrs. Steven's Candy Shops. Both the top and bottom of the box are injection molded, an indenture in the bottom edge insuring a snug fit for the cover

The full addresses of companies mentioned on these four Plastics Products pages are listed on page 225



A new note for pianos and organs—sharps molded of Bakelite. The plastic keys are said to retain color, texture and uniformity and be adaptable to mass production. Shaw Insulator Co. transfer molds keys in a 20-cavity auxiliary plunger. No finishing operations are required



Guardian of the family jewels, this wall bracket with holders for rings, bracelets, necklaces and wrist watches, is made of Plexiglas. Davis Plastics fabricates the handy gadget which can be hung on the kitchen or bathroom wall with one screw—where it is convenient to all

PRODUCTS



At home or afield—a sealed oil can that is always where you want it. Lumarith, chosen for this container because of its shock resistance and transparency, allows visibility of the last drop of oil and assures the contents against pollution through reuse of the can. Tri-Pak Gun Kit, Inc. is the manufacturer



A hard scratch resistant surface, an unlimited range of colors and easy moldability explain the use of Beetle for this Constance Bennett compact. Five wells are molded into the base of this compact into which are fitted separate containers for powder, rouge, eye shadow, foundation cream and lipstick. The lid is hinged to the bottom of the compact with a metal pin

A tissue container that can take the rigorous and continuous handling it will undoubtedly receive, is molded of Styron, Lustron or Bakelite polystyrene. California Moulders, Inc. injection molds the box in two parts—base and top—in Reed-Prentice presses. Assembling is simple, consisting only of hooking the top to the base with two small catches molded into either end of top. Ivory, pink, blue and green, to blend with most decors, are the colors in which holder is available



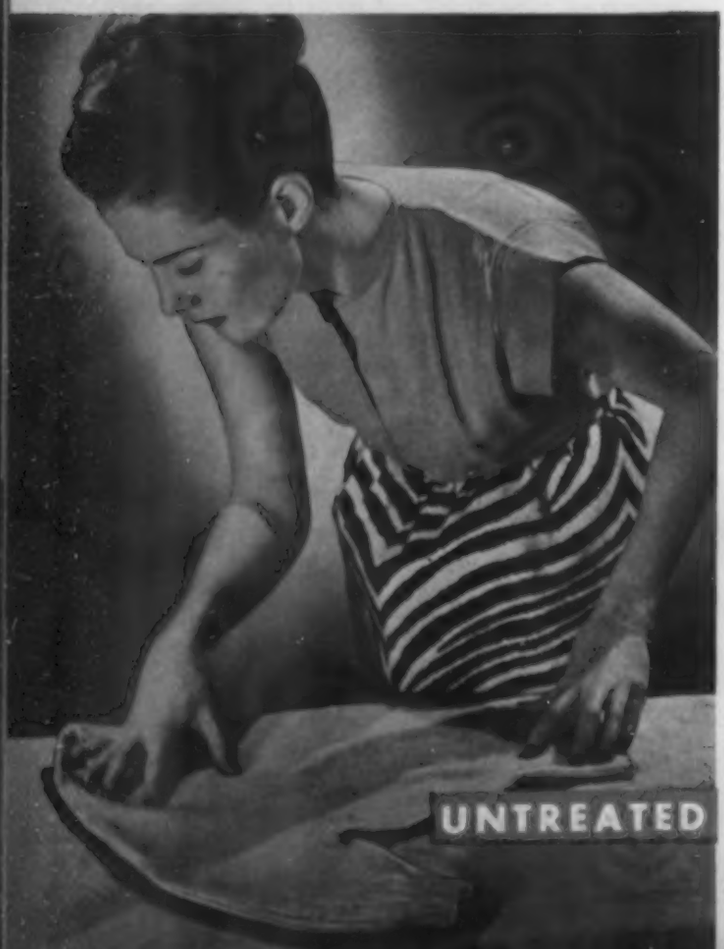
Resin treatment of fabric



PHOTOS, COURTESY UNITED STATES RUBBER CO.

Above—Wool sweaters—one treated with a shrink preventive resin, the other untreated—were originally same size

Below—Untreated sweaters must be stretched after washing to keep them from shrinking as much as 50 percent



AS THE versatility of plastics has increased, we have watched them invade new fields. For some applications they have shouldered aside such natural materials as wood, steel, cotton and wool. In other uses, they have bolstered the traditional materials and, in so doing, added to their own and the other materials' attractiveness and serviceability.

In the textile field, for example, we find man-made materials not only supplying new fibers, but also acting as finishing agents to improve the appearance and wearing qualities of time honored wool and cotton.

Among the newcomers to this fascinating task of giving new life to old fibers is a pair of resins developed by United States Rubber Co. and now in production at its Naugatuck Chemical Division. One is a shrink preventive called Koloc. The other is Kandar, which lends a permanent crispness to a variety of fabrics.

These resins are milk-like liquids in which woven or knitted fabrics are dipped by the manufacturer. Neither requires curing. It is claimed that they maintain their properties, through repeated launderings and dry cleanings, for the life of the garments they protect.

Shrink preventative

It would be interesting to know just what makes wool shrink. There are several theories, but even the experts cannot agree which is the most likely one.

However, one theory is a little easier for the uninitiated to understand and perhaps is as good as any. According to this theory, shrinkage is a function of the tiny scales which grow on all animal hair. The human hair is no exception. Try this experiment: Take a loose hair between thumb and forefinger and rub in its lengthwise direction. You will find you can make the hair move in one direction only. That is because its barb-like scales, all of which point in the same direction, catch on the skin of the fingers.

Now, in a wool garment, which is a fabrication of sheep hairs, the fibers lay at random—some with scales in one direction, some in the other. Scales of adjacent fibers often interlock. But as the fabric is worked and scrubbed, during laundering for instance, the fibers are pushed back and forth along each other. The scales disengage and then re-engage farther along the fiber. It is a ratchet-like action, each fiber moving only in one direction, and serves to shorten the yarn.

That is one theory on the mechanics of shrinkage. The shrink preventive, Koloc, overcomes this action by bonding or filling in the ratchet-like scales. The result is that woolen garments, which have always been

* Manager of Colloids and Plastics, Naugatuck Chemical Div. of United States Rubber Co., Naugatuck, Conn.,

for { Shrink prevention / Permanent starching

by GEORGE R. VILA*

No cure of the thermoplastic resin is needed in either treatment; the fabric is simply dipped in solution

the greatest offenders in shrinkage, can be laundered in a regular washing machine with cottons. The housewife will find that her most choice woolens can be washed instead of requiring dry cleaning.

Tests of the shrink treatment

In laboratory tests, wool garments and test strips have been laundered for one hour at 120° F. in a fully loaded household type washing machine with good soapy water. This laundering, of course, is more rigorous than a normal home washing. Untreated pieces shrink between 30 and 40 percent in area. Treated articles shrink less than 3 percent in area.

In durability tests, wool blankets were laundered 20 times in succession and the dry blankets were weighed after each laundering. The loss in weight was very slight, representing only loss of original loose fibers.

Two years ago one of the men working on the development of this shrink preventive resin put treated wool sweaters into service on his young son. The sweaters have gone through rough play, soilings and weekly launderings. Outgrown by the first son, they were handed down to his younger brothers.

This longer service is partly due to the fact that the Koloc resin has the effect of strengthening the fabric as well as preventing shrinkage. Tensile tests have shown that the treatment increases strength 10 percent or more. And results of abrasion tests revealed that the finish increased abrasion resistance up to 50 percent.

Applying the resin

The textile resin is relatively easy to apply. At the textile mill, the woven or knitted fabric is dipped in milk-like Koloc. The wetted fabric is allowed to stand for an hour or so, after which the excess liquid is washed out in a rinse bath.

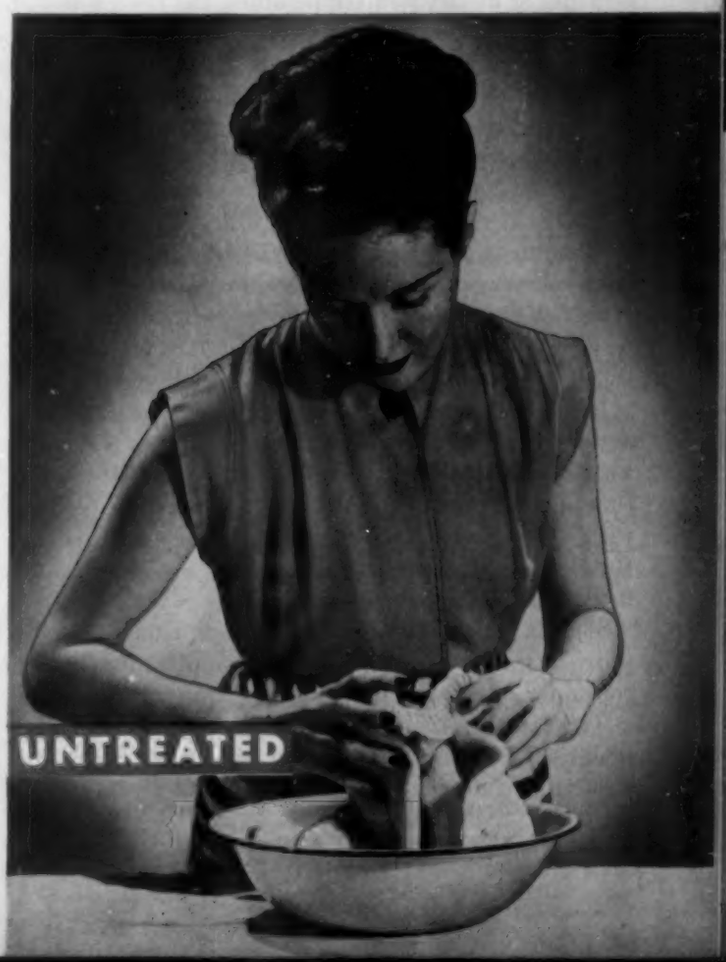
This shrink preventive differs from others on the market in that no heating or curing is required. Nor is it necessary even to dry the fabric immediately. If desired, other wet finishing operations, such as dyeing, may then be conducted. Or, the resin may be applied after dyeing.

When the fabric finally is dried, either at room tem-



Above—No tedious stretching is needed with resin treated sweater. Anti-shrink agent also imparts a longer life

Below—Sweaters need no longer be carefully hand washed. If treated with another thermoplastic resin, garments retain a slight starchiness that is unaffected by laundering





New way of laundering wools is to toss them in a washing machine. Resin treated garments and blankets have been washed 20 times at 120° F. in loaded household machines without any appreciable shrinkage or loss of weight

perature or at elevated temperature, the resin sets and bonds the fiber scales. It is then invisible, even under a microscope. The treatment does not stain or discolor white fabrics. When used in conjunction with a dye, the treatment may affect the shade of the color. But it is possible to adjust the dye to the desired color.

Permanent starch

Many textile fabrics, particularly cottons, have a more pleasing texture if they have been treated to give them crispness or fuller body. Consequently, textile finishers have adopted the custom of using starches or gums to improve sales appeal of fabrics.

However, during the course of a few launderings or dry cleanings, the commonly used starches and gums wash out of the fabric, leaving them with a wilted and thin appearance. Of course, crispness can be restored with each laundering by using a household starch. But the result lacks the professional appearance of a factory finishing.

That is why the thermoplastic resin, Kandar, should prove attractive both to textile manufacturer and to consumer. Its starching effect is permanent.

The treatment improves fullness, hand and draping qualities of cotton, wool, rayon, silk, linen, nylon and paper fiber fabrics. For example, it can give a billowy cotton evening gown draping qualities approaching silk. In another sense, the finish is a preservative, keeping the textile fibers tacked into place. It controls lint and brightens the color contrast of prints.

How starch treatment works

The degree of starchiness imparted can be controlled by regulating the concentration of the Kandar dispersion in which the fabric is dipped. It is supplied with 25 percent resin solids but before use is diluted to 1.5 to 4 percent solids.

It is explained that the resin produces its effect by "bonding fibers to fibers and yarns to yarns," giving the fabric a certain rigidity. However, the yarn-to-yarn bonds can be broken down by passing the fabric through a calender. Then it has a softer, fuller body.

Testing and applying treatment

Laboratory tests, for durability of this thermoplastic resin treatment, included a series of 15 successive launderings by the standard A.S.T.M. procedure, which is a 45-min. washing at 160° F. with soap and soda ash. After these launderings, which are more severe than normal home washings in a machine, Kandarized fabrics still retained their original starchiness and brightness.

The resin is deposited on the fabric in tiny particles averaging 0.1 micron in diameter. It does not require curing. However, to set the particles and make them adhere permanently to the fibers and yarns, they must be flashed at 250° F. at some point during the processing. As supplied, Kandar has a pH slightly on the acid side, which means it will not interfere with other finishing operations, such as dyeing. Its low surface tension, which is lower than that of water, makes it easily absorbable into fabric without the use of a wetting agent.

The resin is claimed to possess high chemical stability. It is also stable to heat and particularly stable to light. White or colored fabrics are free from discoloration by the resin. Further, it does not tenderize the fabric. Actually it increases tensile strength 5 to 10 percent. Nor does it retain chlorine from bleaching solutions or cause skin irritations. The resin does not have objectionable odor.

Kandar is compatible with softening agents and nearly all other finishing agents normally used. Pigments, fillers and dyes do not affect the resin and it does not interfere with the function of these materials. The cost for application of this finishing agent is said to be very reasonable, averaging $^1/_2$ cent per yard of fabric treated.

The men who have developed this starch treatment have done some estimating on potential markets. Analysis of all types of textile applications indicated that nearly 30 percent of all textiles would benefit from a finishing agent like Kandar. Calculated on the basis that the agent would be most useful in cotton and rayon, this 30 percent represents nearly one billion pounds of cloth per year.

West Coast S.P.I. conference

Approximately 160 persons attended the Fourth Annual Spring Conference of the Pacific Coast Section of the S.P.I. held at the Biltmore Hotel in Santa Barbara, Calif., on March 20 through 22, and heard the speeches which are reported here in brief. At the first morning session, presided over by Robert A. Cooper, chairman of the Pacific Coast Section of S.P.I., Honorable Herbert E. Weyler, Mayor of Santa Barbara, delivered a greeting from the city. R. B. Gutsch, conference general chairman, presided over the luncheon on Thursday, March 20, while Ralph R. David, editor of Pacific Plastics was chairman of the afternoon session. The dinner program, presided over by Neil O. Broderson, president of Rochester Button Co. and the S.P.I., consisted of speeches by Charles Lichtenberg, assistant general sales manager of Monsanto Chemical Co.; William T. Cruse, executive vice-president of S.P.I.; Frank Wilcox, past chairman, Pacific Coast Section of S.P.I. and J. R. Yockers, California State Fire Marshall.

Chairman of the luncheon meeting on Friday, March 21, was Ralph C. Shuey; Frank Moss, director of the Pacific Coast Section of S.P.I. introduced W. S. Landes. Dinner was presided over by Robert A. Cooper, chairman of the Pacific Coast Section of S.P.I. The main speaker was Louis Disser, western representative for A. J. Browning, vice-president in charge of purchasing for Ford Motor Co. who spoke on "The Ford West Coast purchasing program."

P.M.M.A. and its industry purpose: *J. R. Hoover*, vice-president, B. F. Goodrich Chemical Co. and president, P.M.M.A.—Despite the very divergent problems facing different materials' manufacturers by reason of the differing end uses for their products, these chemical companies do have in common a unanimous desire to promote the use and general welfare of plastics. To implement this desire, the materials companies, through the P.M.M.A., have undertaken the following activities: 1) publication of a technical data book of plastics; 2) sponsorship of a 5-year $150,000 research project at M.I.T. to study engineering properties of plastics and develop better tests; 3) materials-supply surveys; 4) cooperation with Bureau of Census in classifying and supplying data on production and consumption of plastics; 5) development, in cooperation with Bureau of Standards, of commercial color standards for urea and polystyrene; 6) programs promoting safety of workers and improvement of industrial relations; 7) public relations activities to counteract misinformation on plastics; 8) cooperation with trade and technical groups in plywood industry to promote sound growth of use of plastics in this field; 9) cooperation with S.P.I. and S.P.E. on industry problems.

What is the 1947 materials picture?: *Frank Carman*, general manager of P.M.M.A.—Significant changes in the plastics materials picture since the last P.M.M.A. report to the industry are: 1) an improved supply status for molding materials to the extent that thermoplastic molding materials supplies are generally equal to requirements, but thermosetting materials are still short of current demands; 2) the delays in the expansion program of the materials producers are not seriously hampering production. What is restricting supplies of many plastics are shortages in supplies of basic chemicals; 3) further expansions in the plastics industry cannot be made without provision for increased supplies of basic chemicals; 4) molders, fabricators, designers and engineers can lay plans for an increased and a continual flow of materials in 1947 and the years ahead.

Plastics—fact or fiction: *J. R. Price*, manager, consumer film and sheeting division, Bakelite Corp.—The postwar period was characterized by a flooding of the market with inferior merchandise, hectic buying by the consumer and inaccurate prophecies by writers as to what the public could expect from plastics. All the persons mentioned above helped foster the misconceptions leading to the recent retail slump and to considerable disapproval of plastics products by both consumer and retailer. If public misconceptions regarding plastics are to be corrected it is essential that all manufacturers maintain quality in their finished products which means both proper formulation and proper use of a material. Another important job is the education of the public as to the differences between plastics.

Quality of plastic consumer items: *C. J. Romieux*, sales manager, American Cyanamid Co.—To a considerable degree the poor quality plastic consumer items concerning which we have heard so much in the past few years have been the result of material shortages. With plastics in more liberal supply there should be no excuse for the misuse of a plastic material. Often it is not the application that is at fault but the particular plastic that was used. To correct this situation P.M.M.A. have underwritten a research program at M.I.T. designed to gain greater knowledge of the mechanical behaviors of plastics; and material manufacturers have instructed their staffs to insist upon proper design and selection of the materials they sell. Buyers of wholesale and retail establishments should be made so well acquainted with plastics that they would not offer for sale plastic articles that fail in use. One way is through lectures like those sponsored by S.P.I. at New York University.

Consumer education through proper advertising: *Harry Howard*, advertising and sales promotion specialist—No matter how good a product or how fairly it may be priced, its success depends finally upon acceptance by the consumer; and acceptance by the consumer can be stimulated by advertising. Control of advertising should be in the hands of someone versed in the subject and someone who is close enough to top management to be acquainted with every detail of policy. With the advertising director selected, the advertising campaign becomes a matter of determining the size and spread of the market, deciding on the objectives to be reached by the advertising, selecting the media and determining the method of presentation. Advertising is one way in which the plastics industry can educate the public—one of its most important jobs today. This education can come through "tell all" and "reason why" copy that is simple but effectively illustrated, direct and very factual.

What do department stores want from us?: *M. S. Dowley, Jr.*, home furnishings representative, Associated Merchandising Corp.—Department stores want four things from the plastics industry: 1) quality; 2) consumer education regarding plastics; 3) more thorough research and pretesting before items are marketed and 4) closer relationship between the industry and the re-

tailer to the end that the plastics industry may have a better understanding of the wants of the consumer.

Thermoplastic laminates: *L. T. Barnette*, manager of Plastic Markets, Hercules Powder Co.—Thermoplastic laminates, developed during the war, were taken under investigation by the Hercules Powder Co. in 1943 because of: 1) the industrial interest in low-pressure materials, 2) the high impact resistance of unreinforced cellulose-derivative plastics and 3) excellent color and decorative possibilities inherent in these materials. It was established that there were two practical methods of laminating. In one, successive layers of cloth and plastic solution can be laid over molds of wood, plaster or similar material, and then set aside to dry. In contrast to this no-pressure process, there is the method whereby the base material is cut to size, coated with plastic and placed in a laminating press where it is subjected to a temperature of about 375° F. and pressures of about 100 p.s.i. Research has also indicated that cost reductions are possible through elimination of solvents in the operation of coating or impregnating the cloth. It is important to keep in mind the fact that cellulose-derivative laminates make up a family of products rather than being any one single product. The properties can be varied over a wide range depending upon the type and amount of plasticizer, the selection of filler.

Developments in plastic foams: *W. C. Goggins*, manager of plastics development division, the Dow Chemical Co.—A plastic foam is an expanded high molecular weight plastic having a distinct cellular structure. These foams are characterized by their light weight, low thermal conductivity, good strength-weight ratios and, in many cases, good water resistance. They have been found useful in refrigeration insulation, buoyancy agents, sandwich structures, building construction, displays and novelties.

In the United States, the plastic foams which have attracted most interest are based on urea-formaldehyde, phenol-formaldehyde, cellulose acetate and polystyrene. Urea-formaldehyde foams were produced in quantity for flotation work even though they lacked water resistance. Phenol-formaldehyde and polystyrene were used with limited success for foaming-in-place applications. Cellulose acetate foam was announced late in the war and designed particularly for use in sandwich structures.

Polyester resins: *R. E. Nelson*, plastics sales manager, Naugatuck Chemical Div., U. S. Rubber Co.—The first applications of polyester resins, which were developed during war, laid emphasis on physical properties. This early work was mostly laminating. With the coming of peace the initial effort in this field was to improve the surface finish and appearance of the low-pressure products. Other methods of using polyester resins have also received more intensive consideration. Casting of polyester resins, for example, is rapidly coming to the fore. The number of resins available for casting has been too few and the complicated technique of their successful use has limited widespread usage. However, the colors available with these resins plus their superior resistance to aging and discoloration are important advantages in jewel and lense applications, etc. Another use for these resins is in impregnation work to infuse porous solids to seal off porosity or to impart added strength or chemical resistance. The most recent work with polyesters is in connection with loaded or pigmented compositions for pressure molding—a most interesting field of use.

The 1947 business prospectus: *W. S. Landes*, vice-president of Celanese Plastics Corp.—Today we are experiencing a downtrend in business which, in a sense, parallels the situation after World War I. Plastics, like other business, is suffering from a let up in buying on the part of the consumer, from cuts in inventories on the part of dealers, intermediate manufacturers and jobbers, and original manufacturers (molders and fabricators in the case of plastics). Some retailers have held off buying plastics because of unfortunate experiences with poorly made wartime products. Others are refraining from buying at this time in the belief that prices will come down further. Among the uncertainties that are presently keeping people from investing heavily in goods are: the foreign situation, the labor situation, taxes and prices. The points where the plastics industry differs from general industry are: 1) the business is still relatively new and the full momentus of industrial applications has not yet reached a peak; 2) the price situation with regard to plastics is more favorable than it is with business in general; 3) plastics materials manufacturers, by the investment of upward of 125 million dollars for expansion, have shown faith in the future of the industry. The one negative factor affecting plastics is the bad reputation it has in some quarters because of some misapplications and poor quality goods.

The plastics industry today is not merchandise-minded. There are plenty of good molders but not one out of five knows how to sell his products, knows his costs, knows his methods are right and when someone offers to sell for 2 cents less can stand up and say "go ahead and buy. This is a fair price. If it is less, I will be giving you my profit. Try his product, then come back and see."

Recent trends in radio frequency gluing: *Jack B. Cunningham*, president, Short Wave Plastic Forming Co.—The electronic machine called the Short Wave Woodwelder, discussed by Mr. Cunningham, will be described at length in the May issue of Modern Plastics.

Geon latices: *Ray Bitler*, West Coast sales manager, B. F. Goodrich Chemical Co.—Geon latex is a generic name applied to colloidal dispersions of vinyl chloride type polymers in water. The material resembles natural rubber latex and deposits a film with all the major properties of Geon resin. From it developed the Geon plastic latices in response to a demand for a material that needed no compounding prior to use. Film deposited from Geon latex at room temperature is non-coherent, powdery and opaque. It requires a heat treatment to develop full physical properties. Since films deposited from straight uncompounded latex tend to be too brittle, common practice is to add plasticizer to obtain the desired degree of softness and flexibility. Geon plastic latices have essentially the same stability and handling characteristics as straight Geon latices.

Processing Geon latices follows, with only minor changes, the methods generally used for solution coating of fabrics. The materials can also be sprayed. Drying can be done in an oven or tower with a bank of infrared lamps—the type of heat treatment depending on such factors as amount or type of plasticizer, thickness of deposit, nature of materials coated. Geon latices impart such properties to a product as good wear and scuff resistance, mildewproofness, flameproofness and waterproofness, grease resistance. Among present applications are shower curtains, lightweight raincoats, umbrellas, tents and awnings, upholstery and wall coverings.

Low-pressure laminating cost analysis: *Wm. I. Beach*, president, Behabry Plastics Corp.—One of the biggest problems to the low-pressure industry today is a way of determining the costs. On the basis of bids worked out by a number of producers—bids, incidentally, that differed very markedly—it seems fair to say that for a glass fiber mat reinforced plastic product of about the same size and construction as a machine housing, labor, overhead and profit should approximate 54 percent; material, 25 percent, and tooling, 21 percent of the consumer cost. Intangible costs that are often overlooked are: 1) development costs which naturally crop up in an industry as young as the low-pressure business; 2) rejection of parts. When the vacuum bag method is used a conservative estimate for rejections is one part out of every ten. When positive pressure metal molds are used rejects as low as 1 percent are reported; 3) non-productive activity pertaining to tool planning, work scheduling, purchasing and supervising. Direct costs need not take long to discover. They involve material, labor and tooling. The introduction of automatic or semi-automatic press operated heated dies should help in the reduction of low-pressure costs.



This laminated vinyl floor tile comprises a 1/16-in. thick vinyl chloride top layer bonded to a 3/16-in. thick layer of ground cork that is held together with synthetic rubber resins

Not only is this laminated vinyl floor tile highly resistant to abrasion, but it offers a non-skid surface that seems at variance with its glossy appearance

ALL PHOTOS, COURTESY U. S. STONEWARE CO.

Laminated vinyl tile flooring

ANOTHER big chapter in the development and use of vinyl resins is beginning to show up in advertising headlines. Vinyl flooring is now on the market with the demand running far in excess of the supply and with merchandisers just as excited about it as the rookie who has just smacked his first home run.

Development work has been going on for three years in the factories of some of this nation's most important industrial factories, but shortage of materials and certain processing and handling difficulties have made them extremely chary of publicity or grandiose claims.

The United States Stoneware Co., the Armstrong Cork Co., Goodyear Tire & Rubber Co., Inc., Delaware Flooring Co., Sloane-Blabon Corp., are among the leading companies, known to be in the field, which have already announced their product or will do so in the near future.

As usual with new plastics developments, the public must be cautioned to watch for the real thing. Genuine vinyl flooring is quite different from what some producers call "plastic flooring." The latter has been on the market for many years, but no one thought of calling it "plastic" until the word developed sales appeal. Many so-called plastic floorings are nothing more than old type linoleum or asphalt coverings. They are made by treating woodflour, cork, asphalt, asbestos or other type fillers with linseed oil plus a synthetic (generally phenolic) resin which is employed as a binder.

Vinyl flooring is a *new* product with different properties never to be confused with other types of floor coverings. It is possible that within two or three years, the flooring field may develop into the largest or second largest outlet for polyvinyl chloride and vinyl chloride copolymer resins—accounting for part of the market for the annual 300,000,000 lb. production



The flexibility of the tile is clearly evident in this illustration. Designed for use in hotels, institutions, offices, the tile must be laid by experts, not amateurs



This laminated vinyl tile can be washed with ordinary soap and water. Since liquids do not penetrate the surface of the tiling they can not stain the material

of vinyl which will be available if facilities are expanded, as planned, in 1947 and 1948.

Laminated vinyl tile

Vinyl flooring may be manufactured in roll or tile form and by several methods. The type described here, manufactured by U. S. Stoneware Co. of Akron, Ohio, and called Plastile, is a laminated tile. The top layer, comprising $^1/_{16}$ in. of vinyl chloride compound, is laminated under more than 20,000 lb. pressure to a $^2/_{16}$ in. layer of ground cork bonded with synthetic rubber resins. The two plys are placed under pressure in sandwiches in a multi-platen press for 12 min. at a temperature ranging from 350 to 375° F. No adhesive between the laminates is needed since the vinyl compounds and the synthetic rubber resins have natural adhesive qualities. The laminated sheets as they come from the press are $^3/_{16}$ in. thick and 35 by 35 in. square. These tiles are generally cut with a guillotine type cutting die to the standard tile sizes of 8 by 8 in. or 9 by 9 inches. The standard size for the foreign market is $11^3/_4$ by $11^3/_4$ inches.

Material supply

About $^1/_2$ lb. of vinyl compound is required for each square foot of vinyl laminate in this tile. The prevailing plasticizer shortage is at least partially bypassed because dioctyl phthalate (presently as rare as jonquils in January) is not absolutely essential for this application. Further, by combining laminates of different materials, it is possible to make the vinyl go twice as far as in a solid vinyl tile without sacrificing any of the flexibility so essential for this type of flooring.

Another interesting angle in the supply situation is that eventually some portion of scrap vinyl may be able to be used in the dark colored flooring compound. It is possible that, when vinyl scrap comes into the market in fairly sizeable quantities a few years from now, flooring will provide a good market for its disposal.

Another important feature in this day of flame-consciousness is that the bottom layers of these laminated tiles are treated with fire-retardant chemicals. The top layer is naturally fire resistant due to the properties of vinyl resin. A cigarette will burn its length on the top ply without serious damage.

Plastile is aimed primarily at the market now chiefly supplied by rubber flooring. This vinyl tile is thicker than the type of linoleum ordinarily used in the home. As flooring material, it is designed for use in hotels, institutions, department stores, ships, office buildings and for similar heavy duty applications. The size of the market can be guessed at from the fact that 70,000 sq. ft. were installed recently in one new hotel alone.

Characteristics of vinyl laminate tile

According to company officials, Plastile compares favorably with other floorings in abrasion resistance as shown for linoleum and asphalt tile (Table I). They further state that the top surface of $^1/_{16}$ in. gives an abrasion resistance equivalent to about $^3/_{16}$

in. of rubber. The vinyl tile can be washed with ordinary soap and water with no effect from the alkali common in some types of scrubbing materials. Liquids do not penetrate the surface and so do not stain the tile, and ordinary dirt particles can be swept up with ease. The bright, clean appearance is congenital to vinyl products and supposedly will last for the life of the material—a consumer selling point.

The high gloss appearance, which gives an impression of slipperiness, is deceiving. Shoe soles grip the flooring tightly, a condition comparable to the way vinyl shoe soles have been shown to possess non-skid qualities on all kinds of slippery footing. A further deterent to slipping is the fact that waxing of this tile, to give the flooring a smooth finish, is never necessary.

According to the company, other desirable qualities in upkeep that would please building superintendents are that Plastile is oil resistant, does not harden with age and will not crack under low temperatures. At present this tile is being tried experimentally on damp basement floors with favorable results. However, no wild claims are being made for this application. It is logical to believe that a composition containing vinyl on top and synthetic rubber on the bottom will be highly water repellant and test swatches have been immersed in water for months at a time with no ill effects. But it is still too early for claims to be made that this material will transform a wet basement floor into a dry one.

This issue of Modern Plastics marks the beginning of a policy of publishing articles of general interest in the back pages of the magazine. Attention is called to "Stripping molded closures" on page 228 and to the program for the S.P.I. Chicago convention on May 7 through 9, on page 180.

Cost and application

The price to distributors for Plastile in mottled and solid colors is between 50 and 52½ cents a square foot. Laid down and completely finished it will cost the ultimate consumer approximately 75 cents a square foot which is comparable to the price for high grade rubber flooring.

Company officials say, that in their opinion, one of the chief sales assets in merchandising their new product is the ease and sureness with which it may be fastened to the floor. It is their claim that ordinary linoleum cement may be used for adhering Plastile to wood, cement, steel or any other type of floor as contrasted with the special adhesives which are sometimes required with other types of vinyl flooring.

The job of laying this tile should not, however, be attempted by an amateur in the hope of saving money. Any kind of floor covering requires the service of a professional to lay and cut it properly, and even the professionals have had some difficulty in preventing vinyl floor tiles from curling.

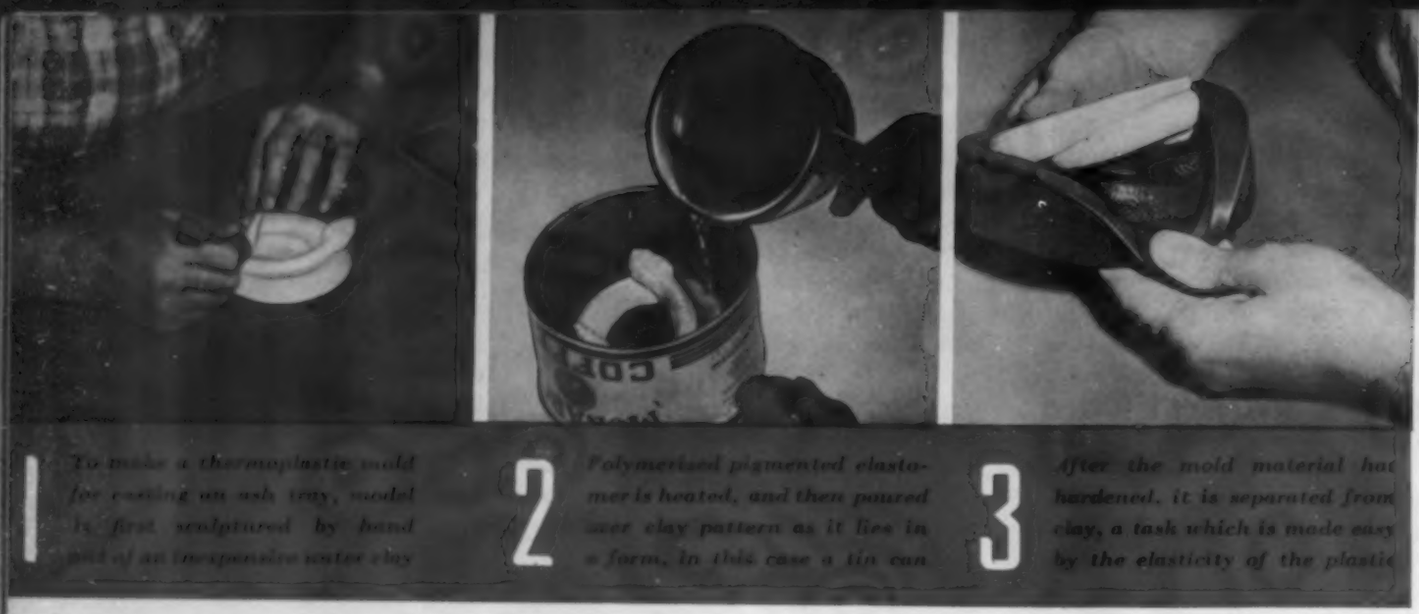
The chief factor in securing a good bond to the floor with this material is the combination synthetic-rubber-cork laminate which permits use of a non-solvent containing adhesive. Through an associate company, the Chamberlain Engineering Co. of Canada (now Plastics & Chemicals, Ltd.), U. S. Stoneware Co. gained considerable experience with adhesives. The Canadian company had almost no trouble in obtaining materials for the manufacture of solid vinyl compound floor tile, but it experienced many problems in bonding its product to the floor. Convinced that the chief problem was in a solvent-containing adhesive, U. S. Stoneware sought a means to eliminate its use and devised the synthetic rubber-cork base which can be glued with the same adhesive used on ordinary linoleum.

According to U. S. Stoneware's explanation, linoleum cements would not always adhere to vinyl as tightly as necessary without roughening bottom surface. When special adhesives containing solvents were used, company chemists noted that there was sometimes a tendency for the tile to curl up at the edges. They contended that the curling was caused by pressure, such as constant walking over the tile, which squeezed the solvent to the edges and up between the joints of the tile. Whatever the cause, they believe that as the solvent gradually migrated either into the air or perhaps into the vinyl itself, the adhesive became brittle and lost its sticky qualities, thus permitting the tile to work loose. It was noted that vinyl tile seldom came loose from soft wood or some types of concrete. In some cases the manufacturer of vinyl flooring recommends that a felt or other absorbent base be used and it is presumed that this base aids adhesion to the floor.

Table I—Tests for Floor Tile (Tests Conducted by U. S. Stoneware Co.)

	Plastile	*Battleship linoleum*	*Linoleum*	*Asphalt tile "A"*	*Asphalt tile "B"*	*Asphalt tile "C"*
Tensile strength, lb.	1782[a]	562	1094	1510	1149	1378
Elongation in 2 in., %	110[a]	4	7.5	2.5	2.5	1.5
Thickness, in.	0.128	0.128	0.08	0.125	1.182	0.122
Hardness scleroscope	14	18	22	32	26	23
Bend test	Bends flat on itself	Cracks at ⅛ in. radius	Cracks at ½ in. radius		Break at once	
Wear test, grams per hr.	1.45	23.7	26.8	4.68	1.02	17.5
Comparative time to wear off 1 oz., min.	1170	72	64	363	1667	97

[a] Applies to top lamination only.



1 *To make a thermoplastic mold for casting an ash tray, model is first sculptured by hand out of an inexpensive water clay*

2 *Polymerized pigmented elastomer is heated, and then poured over clay pattern as it lies in a form. In this case a tin can*

3 *After the mold material has hardened, it is separated from clay, a task which is made easy by the elasticity of the plastic*

THERMOPLASTIC elastomers which are suitable for both injection molding and casting can now be produced by plasticizing polyvinyl chloride or related resins with the monomer form of diallyl phthalate. They are characterized by chemical inertness, flexibility or stiffness properties that may be varied indefinitely, pourability in the molten state and excellent reclaimability without additives.

The basic formula calls for 25 parts polyvinyl chloride (such as the Geon 101 compound) to each 100 parts of diallyl phthalate. Basic lead carbonate, calcium silicate or lead titanate in quantities of 5 to 20 parts will satisfactorily stabilize the polyvinyl chloride at elevated temperatures. Small quantities of vegetable oil (not more than 5 parts) will increase the molten fluidity of the elastomer.

Mixing and fusion of the ingredients occurs at temperatures ranging from 265 to 325° F., and may be accomplished by constant agitation in a double boiler or Banbury mixer. Heating to over 350° F. should be avoided to prevent deterioration.

The end-product of the basic formula after it is cooled to room temperature is an extremely flexible, milk-white, non-porous material. It is particularly suitable for the manufacture of rubber-like molds, because its slick surfaces will release casts of many materials without being coated with parting agents such as wax. Balls, floor mats, shock absorbers and other articles can be injection molded with the new elastomers. However, cost considerations may keep them from being competitive with other rubber-like or rubber compositions in this field for some time.

Varying the formula

Formula variations may be achieved as follows:

1. For greater stiffness reduce the quantity of plasticizer. The material can still be cast by pouring, if as little as 75 parts diallyl phthalate are utilized.
2. For maximum temperature resistance use optimum quantities of the stabilizer (basic lead carbonate is much preferred).
3. For greater flexibility or thermoplasticity increase quantities of plasticizer. Exudations of plasticizer can be eliminated later by soaking the end-product in chloroform.
4. For different color effects use anthraquinone or indanthrene blues, yellows, or oranges; phthalocyanine blues or greens and cadmium or lithol reds.

Butyl phthalyl, butyl glycolate, dioctyl phthalate, tricresyl phosphate, triglycol ester and other conventional polyvinyl chloride plasticizers may be used in place of diallyl phthalate as necessary. They will not yield products of the same physical properties.

The making of elastomeric molds

As mold-casting materials, the elastomers have many immediate possibilities because they are in many respects superior to either rubber-latex or glue-gelatin compositions. For example, they can be made into excellent molds simply by melting and pouring over patterns of articles whereas rubber-latex would have to be tediously applied in layers. Although the elastomers resemble glue-gelatin in terms of reclaimability, they have much better flexibility, greater chemical inertness, heat resistance and are easier to handle.

Table I—Physical Properties of Elastomers Formulated with Diallyl Phthalate:

Specific gravity (unpigmented)	1.20 to 1.40
Specific volume (unpigmented) cu. in./lb.	23.0 to 19.8
Specific heat conductivity	$K = 39 \times 10^5$ to 33×10^5 cal./(sec.)/(sq.cm.)/(°C./cm.) or 1.13 to 0.96 B.t.u./(hr.)/(sq. ft.)/(°F./in.)
Specific heat	0.32 to 0.49
Coefficient of friction (dry)	0.21 to 1.80
Coefficient of friction (lubricated)	0.05 to 0.10
Tensile strength, p.s.i.	200
Elongation	2 to 5 times cast dimensions
Volume compressibility	Virtually incompressible
Tearing strength, at room temp.	Like flexible rubber
Impact strength	Like soft rubber
Chemical resistance	Excellent

° Chief engineer, Plastics Research Co., Alhambra, Calif.

Thermoplastic rubber

by ROBERT B. STANTON*

While these plasticized vinyl resins can be used for both injection molding and casting, they are particularly suited for use as mold materials because of their flexibility

PHOTOS, COURTESY PLASTICS RESEARCH CO.



4 *Before casting an ash tray, bits of black ink are splattered in elastomer mold to give the cast object a speckled appearance*



5 *The mixed casting resin is poured into the elastomer mold. As soon as the resin has hardened, cast ash tray may be removed*



6 *The elastomeric molds make possible the casting of shapes with fairly abrupt undercuts*

The elastomer may be cast from the molten state as soon as its ingredients have completely fused, or it may be allowed to cool in any form and then be remelted for use in casting the end-product.

If it is cast on non-porous patterns—such as are made from metals, glass, ceramics and modeling clay—the elastomer will harden to form excellent molds without the utilization of special handling techniques. However, it is at times desirable to preheat patterns to about 150° F. to prevent flow lines.

Good molds can also be made on plaster patterns, if the patterns are polished beforehand with linseed oil soap. In many cases it is desirable to attach a vacuum line to the base of the porous pattern so that expanding hot air can be withdrawn when elastomer is poured.

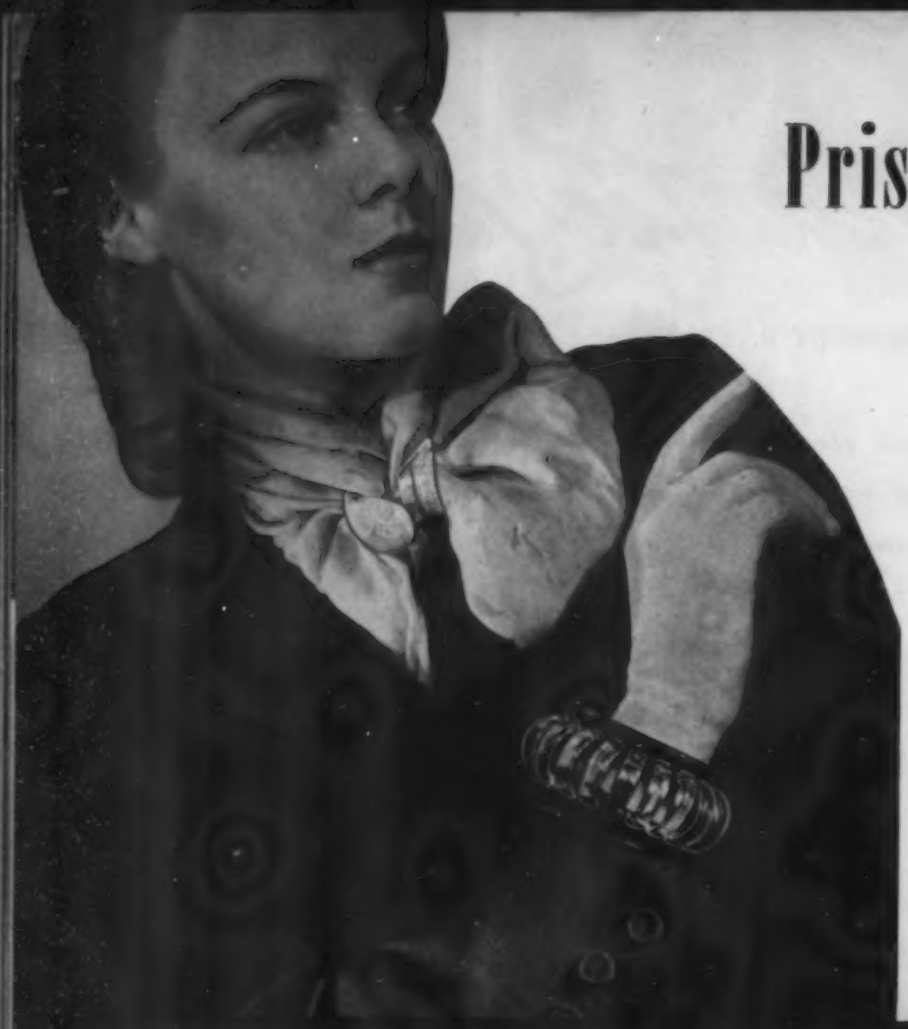
Because the elastomer is extremely stretchable, one-unit molds may be fabricated from patterns with comparatively abrupt back drafts and undercuts. Multiple-cavity molds are made by placing a series of patterns in a single form; piece molds are made by a plaster-backing technique used for glue-gelatin molds.

Materials that can be cast in elastomer molds include most of the thermosetting casting resins, a few thermoplastic casting resins, low-temperature alloys of the Cerrolow and Cerrobend types, ceramics, wax, plaster and other compositions which may be melted or cured at temperatures of less than 225° F.—the maximum elastomer softening point. Thermosetting phenolics have been cast with particular success in such molds after being thinned with alcohol and when a strong hydrochloric or sulphuric acid catalyst is used. The alcohol facilitates the release of air bubbles and serves as a buffer for exothermal heat which dissipates as curing takes place. Thermoplastics with fairly high melting points have been successfully cast by quenching the elastomer mold in water when filled.

An idea of the life of an elastomeric mold can be deduced from the fact that recently such a mold was used to make 1500 identical casts. It was then reclaimed by melting and made into a new mold.

Prismatic designing

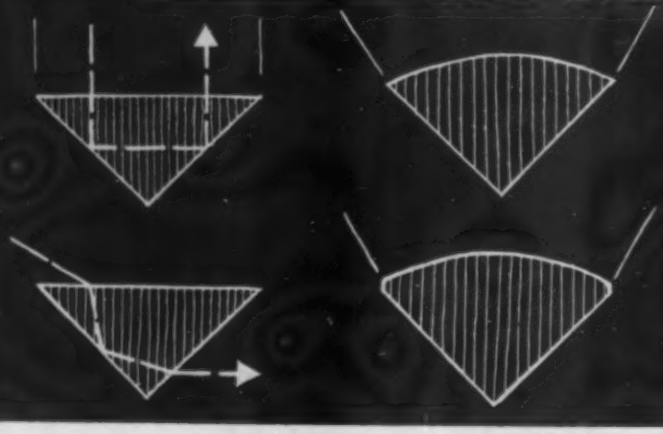
Decorations, carving, laminating of variously colored materials, are not essential to the achievement of brilliance in acrylic accessories



1—This bracelet and scarf pin illustrate the brilliance that can be achieved by forming a strip of acrylic with conical cross-section into flat circles

PHOTOS, COURTESY ROHM & HAAS CO.





2—The 47.8° angles in this chart are areas from which light is reflected when it strikes acrylic material

3—By the addition of a slight curve to the top face of an acrylic prism, its range of reflection is increased

5—The cabochon is the basic cone form which employs the principle of prismatic light reflection in jewelry

6—The cabochon form translated into a cross-section of strip material forms a brilliant circular bracelet



gives brilliance to acrylic jewelry

by HENRY F. PEARSON*

TWO constants of the fashion equation are that whatever is worn must be subordinate to the general costume effect and that a new material must be capable of producing an endless variety of designs within the narrow limits of what is currently accepted as good taste. Once the material has been accepted for fashion, even after a period of imitation of other materials, a designer can proceed to develop functional applications for it in the fashion field.

With the acrylics, designers are nearly through the imitative stage and are beginning to discover how many new and beautiful effects can be produced without disguising the material. Illustrative of this fact are the many beautiful effects our company has been able to achieve in Plexiglas jewelry and dress accessories[1] through concentration on the problem of obtaining reflective brilliance in a completely transparent medium without resorting to decoration or carving, laminates and even colored materials. Our approach is through what might be termed *prismatic designing*.

Principles of refraction

Reflective brilliance comes not from the first or outer surface of a transparency, but from its inner surfaces. To understand the reason for this we must examine the simple laws of light behavior:

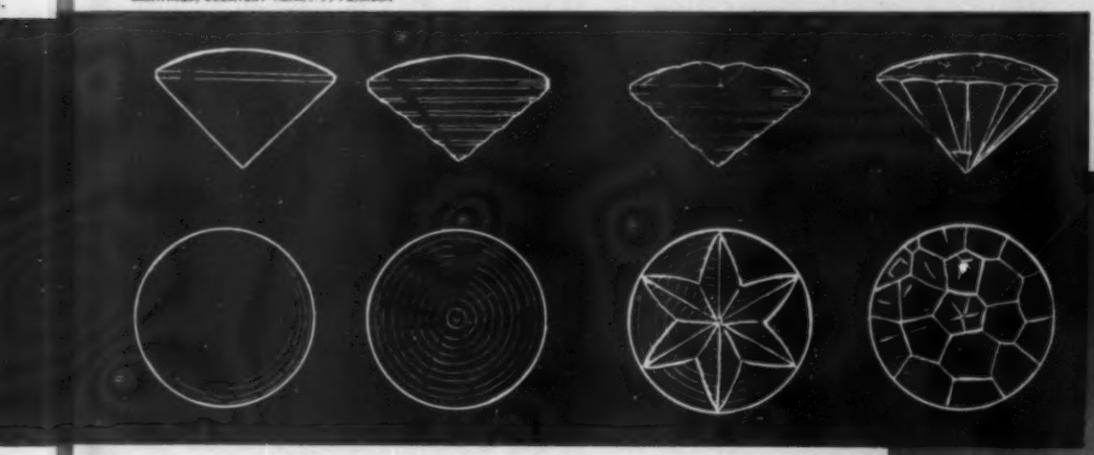
1. Unimpeded light travels in a straight line.
2. Light follows the same path in both directions.
3. Light reflects at an equal and opposite angle.
4. Light is bent down as it passes from one transparency into a denser one, and vice-versa.

Although exterior light may hit a surface at any angle out of the 180°, it is bent downward in such a way as it enters the acrylic that its extreme range in the material is only 84.4° (Fig. 2). Now, since light

* Pearson-Berlinghof, Inc., Langhorne, Pa.

[1] This work was done on assignment for Rohm & Haas Co.

DRAWINGS, COURTESY HENRY F. PEARSON

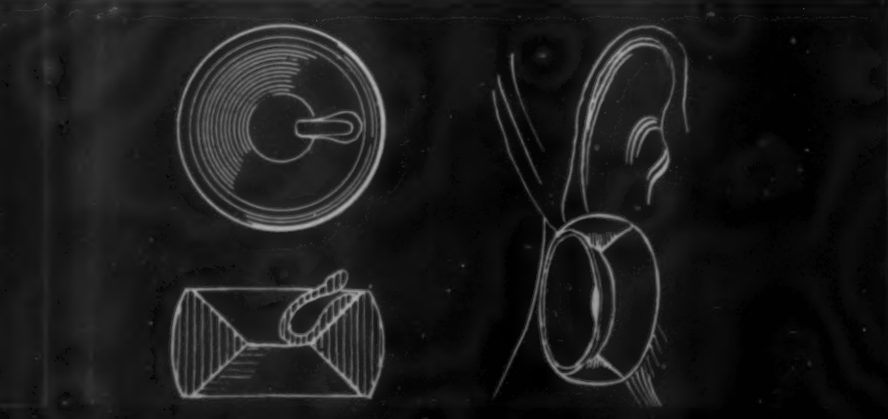


8—Small acrylic pieces in the shape of cones can be strung together to achieve necklace such as one below

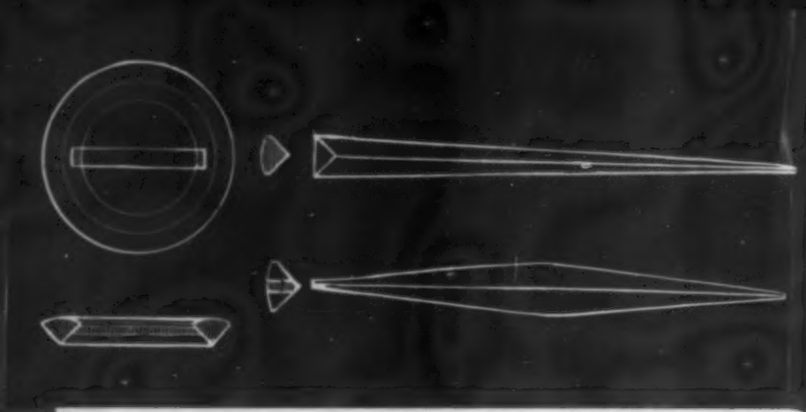


4—When the prism becomes a cone, it may be stepped, grooved and faceted to increase its brilliance factor

7—Earrings and buttons may be developed from the basic conical form through use of flat and wide circular forms







9—Flat circles with conical cross-sections and long pointed prisms are used to make attractive buckles, ornaments

travels the same path in both directions, light in the material that hits a surface within this range can escape into the air. However, by simple subtraction (180—84.4°) there remains an angle of 47.8° on either side of this range. Light in acrylic that hits a surface within this angle cannot get out, but is completely reflected at an equal and opposite angle.

This action of light is called the principle of interior reflection. To turn this into reflected brilliance, the piece of acrylic should be so shaped that the rebounding light can get out to the eye. If the next surface this light hits is at an angle so that it hits within the escape range, brilliance is produced at Z (Fig. 2).

Putting this principle to work in a prism, we find that a 90° prism, seen from the front, has reflective brilliance of a mirror (top left, Fig. 3); seen at an angle, it becomes transparent (bottom left, Fig. 3). To increase range of brilliance of acrylic prism, a slight curve to its top is effective (top right, Fig. 3). By adding a vertical fillet on the sides to relieve the sharpness of the edges without affecting brilliance (bottom right, Fig. 3) we have a simple section on which a great variety of designs can be based.

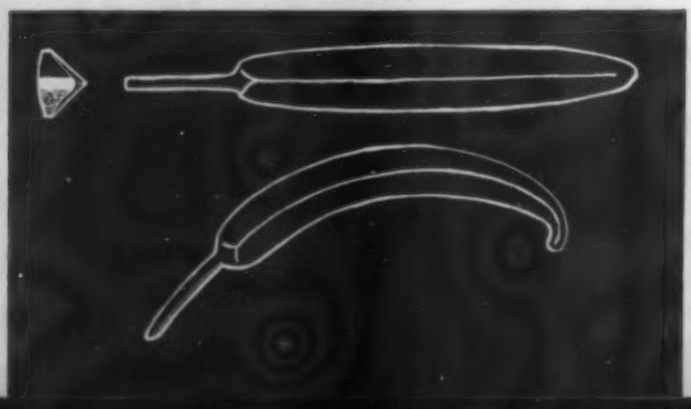
As discovered by Dorothea Marlor, of the Rohm & Haas Co., who worked with me in this research, the revolution of this section produces a cone resembling a cabochon reflecting a disk of clear light (left, Fig. 4). This form can be facetted regularly as a gem and thus becomes an imitation of one. However, there are other ways that this cone might be facetted to break up its reflection into sparkle. If the cone is stepped, it reflects bands of brilliance (Fig. 4); if

10—Belt, necklace and bracelet shown here are formed from strips of acrylic having v-shaped cross-sections



11—Taking sketches in Fig. 9 and translating them into actual pieces of acrylic jewelry might produce a bracelet and shoulder piece such as shown

12—A long prism which is shaped to a curve makes a feather design element of many uses in dress accessories



the top is slightly grooved the reflection is broken into a dazzle of brilliance (Fig. 4). Irregular facets are as effective as regular ones (right, Fig. 4).

Returning to Fig. 3, it can be seen that if the reflective form is mechanically accurate, the reflection is so regular that a mirror-like perfection is obtained. By slight surface angulations, the reflections can be given a flowing, watery brilliance.

Cabochon variants consist of reversing the point (top left, Fig. 5) or reducing it to a series of 90° grooves. Such sections are easily attached to an opaque back plate. Another variant that gives an effect of immense depth is elongation of point (right, Fig. 5). These cones or cabochons can be used in jewelry and accessories as are gems. Larger ones might be used for bag pulls or tops to perfume flasks.

Brilliance in flat strips

Brilliance can be produced just as readily on strips of acrylic with the same cross-section. Such a section (top, Fig. 6) can be used to form a circular bracelet of great brilliance. Made smaller and cut in half, it is excellent for earrings or buttons. In even thicker section and left entire, such a piece makes an earring (Fig. 7) that goes well with a choker.

When the simple acrylic section is used to make a ring with the curved face of the prism on one side, we have a brilliant, flat circle that can be used for a hair buckle or belt ornament. If wider and smaller, such a piece forms a button or earring.

When our simple acrylic section is used on a long, thin prism, it can be heat-formed into a very smart choker. Several widths a short distance apart and parallel, cemented to black Plexiglas at each end form a very successful bracelet (Fig. 10), belt, choker of rigid sections fastened together with supple vinyl.

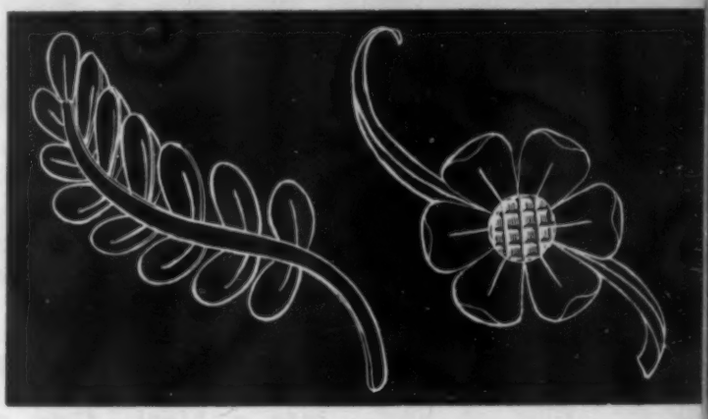
The long prism, tapered to nearly a point at one end (top, Fig. 9) and heat formed into a curving or spiral form with a bowl and thin-nosed pliers produces an organic design element of many uses. When long prism is tapered at both ends (bottom, Fig. 9) it can be spiraled to form single hair ornaments or grouped to form graceful decorations for hair, dress or coat. Shorter prisms, spiraled and attached to a curved prism, form a sinuous and brilliant tiara and bracelet, (Fig. 11). If given a loop at each end, the form can be linked together to make a glittering chain.

The same prism, trimmed into the shape of a feather (top, Fig. 12) can be curved to make a hat ornament (bottom, Fig. 12) or combined to form a wing comb. A short prism, rounded at one end and tapered at the other, cemented in series to a central curved band forms a brilliant frond that can be used as a hair shoulder or waist ornament (left, Fig. 14). The same form, curved upward at the rounded end, can be used as a petal. Cemented to a black disk and a curved stem, a flower is formed that is a gala hair ornament.

So far, we have discussed only one cross section. Other cross sections, such as a half round, are also very brilliant and may be made in a variety of forms. When



13—Very charming jewelry can be produced by attaching clear acrylic balls to various types of wire supports



14—When the feather-shaped prism is shortened to become a leaf or a flower petal, its possibilities are increased

brilliance is not a requisite, the field of designs for acrylic becomes boundless. For example, crystal spheres of various sizes, attached to an inconspicuous head band with supple wire, form an ephemeral and mobile head decoration (Fig. 13). When a band of acrylic material is heated, stretched and released when half cool, its edges ruffle with remarkable regularity. Formed into a large or small circle and split lengthwise, such an acrylic piece makes a demure head ornament and bracelet. A smart ensemble of buttons, earrings and a ring can be made by boring a diagonal hole through two adjacent sides of a cube.

The use of acrylics in jewelry and dress accessories has only begun. Once fashion starts to use the material for its own merit and forgets that it can be made to work like something else, an endless variety of beautiful new forms will appear.





Above—First step in making propeller blades is coating veneers with resin. After this, strips are laid up so grain lines of alternate veneers form 30° included angles

Left—A 3-place Rocket plane has exceptionally high performance which is largely due to the use of an aeromatic propeller. Blades of propeller, carved from resin-bonded veneer billets, have about the same strength as metal and are only slightly heavier than those of solid wood

PHOTOS, COURTESY DUREZ PLASTICS & CHEMICALS, INC.

Propellers from laminated wood billets

Phenolic resin-coated wood veneers are formed into a block, then carved to a desired shape

EVER since World War I, when plywood was first introduced as a structural material for aircraft, there has been much discussion pro and con as to its suitability for such applications. Because of the inadequacy of animal glues and the sketchy wood data available, the years between World Wars I and II saw metal gain a dominant position in aircraft construction. World War II, however, brought into focus the advancements made in wood and glue technology and accelerated their use in finished planes.

One of the resin-bonded plywood applications which has made especially rapid strides is the laminated propeller. Wood, of course, has long been used for the propellers of light planes, but it was felt that these could be improved and wider application obtained by abandoning the idea of carving the blades from solid billets. Early efforts in the laminated wood field resulted in the use of this material primarily for test clubs. These are mounted on engines during test runs to simulate the stresses set up when the engines are actually in use with regular propellers.

The Laminated Process Co., of Portage, Wisconsin, became interested some 10 years ago in applying the same manufacturing methods used for the clubs to the production of finished propellers. They were aided in experimental work by Army and Navy air forces.

The experimental work was brought to a successful conclusion in time for this company to produce thousands of propellers for successful use in World War II. These propellers were made of Durez resin-bonded veneers and proved themselves superior on several counts to the conventional type of wood propellers. While the latter filled the bill in the never-ending struggle to cut down aircraft weight, they did not have sufficient strength for any heavy-duty applications. The laminated blades, on the other hand, approach the strength of metal and are only slightly heavier than their solid wood counterparts. Laminated blades have,



Before being placed in rubber bag and cured in autoclave (background) layup is placed between metal plates twisted to same angle as pitch distribution



The laminated billets are removed from molding bag. The twist imparted by the metal plates has resulted in glue lines being parallel to center line of airfoil section

in fact, been known to withstand centrifugal, flexural and fatigue stresses which have caused metal blades to fail in a relatively short time.

The Laminated Process Co. blades are now being used by the Bartlett Hayward Div. of the Koppers Co., Inc., for its Aeromatic and Aeromaster propellers, and for two-to-four-bladed ground-adjustable pitch and dual rotation propellers with blades 12½ ft. in diameter. The type of blade employed on these last mentioned propellers has also been used for test clubs, wind tunnel blades and heliocopter rotors.

Layup of laminated billet

These blades are carved from laminated wood billets. In the production of the billet, the veneers are laid up in such a way that the grain lines of alternate veneers form 30° included angles. This layup of resin coated veneers is then placed between two metal plates which are twisted to the same angle as the pitch distribution of the blade design. The assembly—resin-coated veneers and metal plates or molds—is next placed in an air-tight rubber bag and subjected to the heat and pressure of steam in an autoclave. The pressure forces twisted plates together, while heat cures resin adhesive.

After the molding and pressing operations have been completed, the manufacture of the laminated blade closely parallels the methods used for solid wood blades. Automatic wood-carving machines are used to shape the billets—a master pattern being used to guide the cutter blades. Final finishing is accomplished by hand with various abrasives. In the majority of cases the blade is then covered with a black Aeroloid plastic sheet. This covering reduces practically to zero the percentage of moisture which can be absorbed by the blade.

Twisted billet for extra strength

The twist imparted to the laminated billet in the molding operation results in the glue lines, which bond the thin wood plies together, being parallel to the chord line (center line of the airfoil section) throughout the length of blade. This assembly method increases shear strength of wood with no sacrifice in tensile strength.

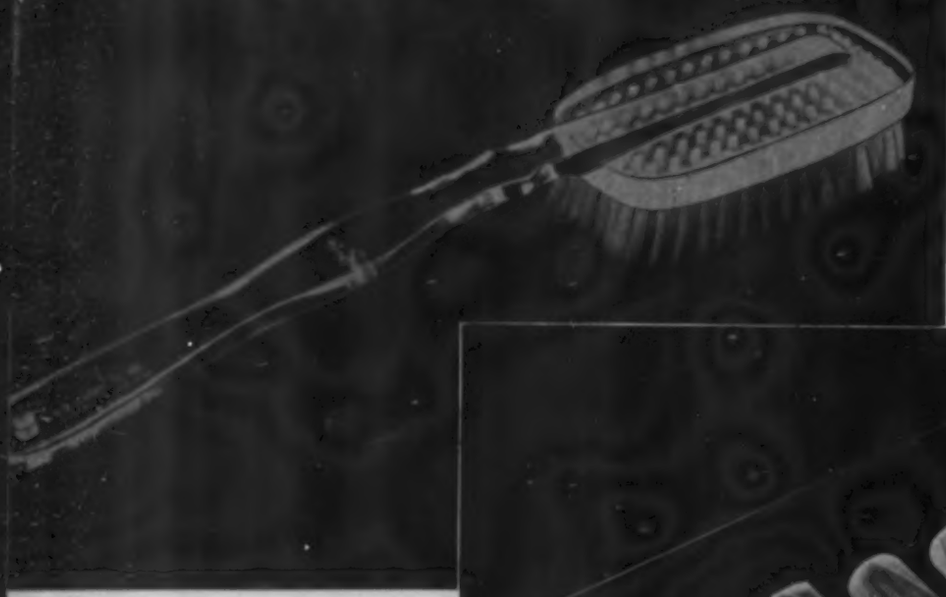
Once the phenolic resin adhesive used as the bonding agent in these laminated blades has been set up through the application of heat and pressure, it cannot be resoftened by any means. Extremes of temperature, constant immersion in hot or cold water, contact with mild acids and alkalies—none of these serves to weaken the bond. If a well-glued joint is subjected to progressively increasing stress, the wood itself around the joint will fail long before the glue line will begin to give.

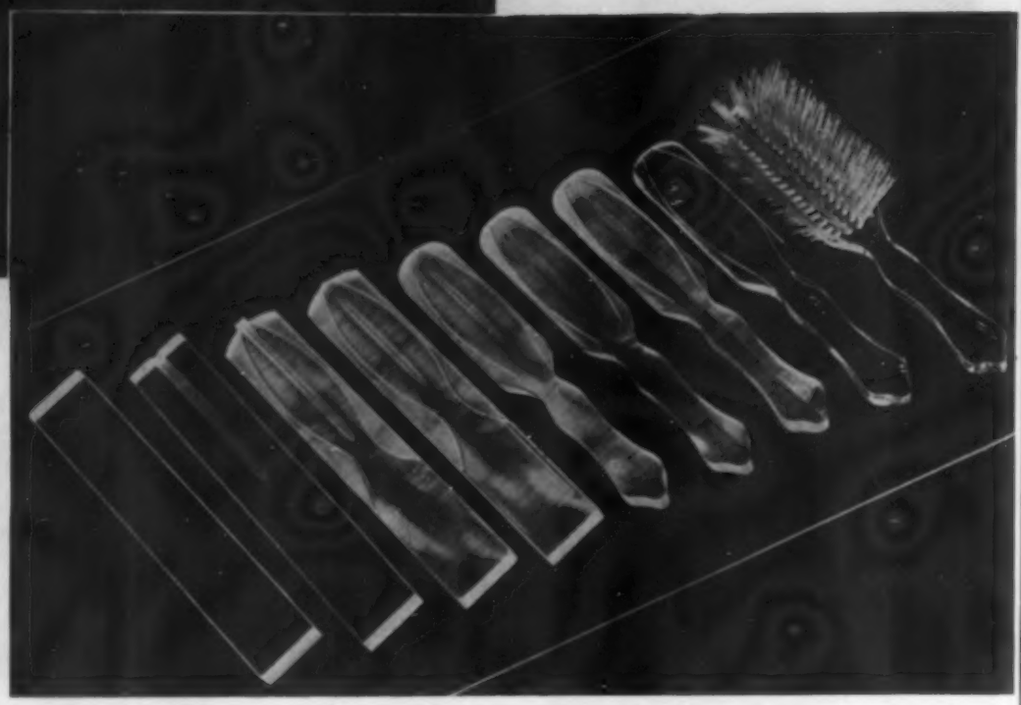
One by one the objections which seemed to go hand in hand with the standard wood blades have been eliminated. Resin-bonded wood propellers are rapidly proving their right to consideration as standard equipment on all types of aircraft.

Automatic wood carving machine shapes the billets to desired form. Final finishing of propeller blades is accomplished by hand with use of various abrasives



Brush





Above—Uniformity of fabrication was essential in this bath brush since handle fits into an undercut in back

Right—Steps in the fabrication of a lady's hair brush

A PROBLEM common to all manufacturers who plan to use acrylic components in their products is whether to injection mold or fabricate. At first glance a decision would seem to be arrived at very easily on the basis of quantity alone; but there are many other factors involved.

Obviously, when a small quantity of parts made to a fairly simple pattern is involved, fabricating is the choice. Just as obviously when the runs are tremendous, injection molding must be used. But when the quantities involved range from 25,000 to 50,000 parts, and when these are to be low-cost parts each case must be studied individually, with mold and material costs and length of cycle weighed against machining, polishing and cast sheet costs. Another factor to consider is the length of time a design will be in style.

Brush manufacturers have a product the back of which seems to cry for injection molding. Low labor costs, small waste, speed of production and the many intricacies and refinements of design, not readily obtainable by fabrication, are admitted advantages of this method of processing.

The brush trade, however, has been undergoing a radical change. When natural bristles were used, the quality of a brush depended on the ability of the manufacturer to mix, blend and process imported and domestic bristles; the brush back was in most cases a relatively unimportant component.

Since the advent of the synthetic monofilament bristle, all brush makers—large and small—have the same bristle. As a result, the styling, functional value and attractiveness of the brush back have become the main merchandising factors. Synthetic monofilament bristles evened up the actual brush so that much of the sales appeal now rests in the handle.

The brush manufacturer who makes an investment of some $3000 to $8000 in molds is at a disadvantage in changing the design of his product at a moment's notice. He also faces the possibility of "down time" should a mold be broken or damaged. In contrast, a fabricator's fixtures, which are readily and quickly built, are quite economical and (in the case of reliable fabricators) are usually provided in duplicate in order to eliminate interrupted deliveries.

Material differences

Cast stock, from which items such as brush backs are fabricated, is less likely to have internal strain than is plasticized injection molding material. Often a molder has to temper his pieces by placing them in hot water or low-temperature ovens after removal from the press to cut down on internal strains. Unless this is done, there is a likelihood of trouble with the molded

* President, Plastock Inc., East Port Chester, Conn.

backs of fabricated acrylic

by EDWIN A. NEUGASS*

items when they are drilled and bristled since the heat generated by drilling can release the strains causing the handles to warp, crack or craze.

It is a popular belief that when brush backs are removed from the mold they are finished. Actually, the gate must be sanded over (usually a wet-sanding operation) and the block polished. It is also necessary at times to buff off the seam. All these steps bring the labor costs of the molder closer in line with those which will face a fabricator.

Theoretically there is no waste in injection molding, since runners and sprues can be ground up and used over again. But such reground material can be a source of discoloration and blemishes in the finished brush backs.

Another commonly held but erroneous belief is that molded products are necessarily produced to closer tolerances than fabricated products. This depends on ability of both the molder and fabricator. An inefficient molder will not precondition his powder to discount the many variable factors in his process; and an inefficient fabricator will not maintain tight jigs and fixtures. But on an average, the chances of good tolerances are more likely to rest with fabricators.

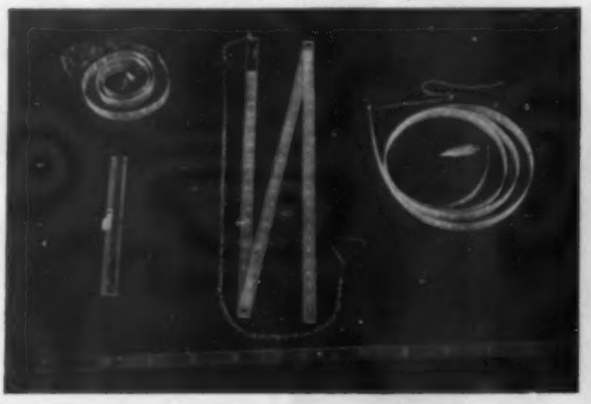
The ladies' hairbrush shown at left is bristled by Empire Brush Works, Inc., Port Chester, N. Y., and fabricated by us from cast acrylic sheeting $^{5}/_{8}$ in. thick. While production cost is higher than that of similar backs made by injection molding, the fact that it can be handled more easily in the bristling plant and its completely clean appearance make it a worthwhile proposition.

The bath brush block shown at left was originally made of wood which cracked and split with continued use in water. The problem here was to make each brush back and handle uniform since the handle fits into an undercut in the block.

Acrylic molding and fabricating are not potential enemies. In cases where standard articles of small thickness, not subject to style variations, are required in great quantities, molding is the best method. On the other hand, where heavier sections, style variations and predetermined ease of bristling are required in brush backs in small or medium quantities, fabrication is the answer. It is in that medium quantity range that a good fabricator shows up to advantage.

FIVE DIFFERENT FUEL TANK GAGES were recently developed by Sweet Practical Products, Inc., Hackensack, N. J., and are being fabricated by B & K Plastics Co., Paterson, N. J. Amazingly simple to use, they take advantage of tendency of frosted plastic to turn clear when wet.

Two gages, in the form of measuring tapes, are made of frosted Palstacele. Both are fitted with weights and chains so they may be fastened to fill caps and left hanging in tanks.



The three remaining gages are in the form of measuring sticks—all made of semi-rigid, $^{1}/_{8}$-in. thick frosted Lucite. The Drum Major (bottom of picture) is used to measure liquids in horizontal or vertical drums. Another gage (center) may be folded for convenient portage by sales representatives or fuel truck drivers.

The third stick gage, the Lo-K-Tor, is used in combination with a metal tape. It is fitted with a Plastacele strip, that runs along the side, and a Lucite clamp. The plastic strips are clear in the center, frosted on the sides permitting the reading of the metal tape figures.

The advantages of the plastic gages are marked. They are made of materials that are non-corrosive and impervious to most chemicals, fuels and alcohol. The gages eliminate the chief disadvantage of the wooden gage—that of absorbing liquids. They also solve problem of quick evaporation which occurs on metal gages.

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Plastics Engineering

F. B. STANLEY, Engineering Editor

Metal detection for better plastic products

by PAUL A. GREENMEYER†

THE electronic metal detector is the adaptation of a wartime development which is especially useful to the plastics industry. Once used to make the manufacture of explosives safer by providing metal-free raw materials, it is now employed to detect the presence of tramp metal in all sorts of plastics raw materials and finished products. It protects valuable tools, dies, molds, engraved rolls, calenders; preserves customer goodwill; assures a higher quality product and increases production rates.

Uses for detector

The metal detector is an electronic inspection device for detecting unwanted metal particles in all kinds of non-metallic products or materials such as molding powders, fillers, resins, plastic sheeting, films, biscuits, preforms. It will assure a product free from all metal—magnetic or non-magnetic, ferrous or non-ferrous. Tin, copper, iron, steel, aluminum, gold, silver, stainless steel, bronze, metal scale, iron rust, etc., will be spotted by this electronic sleuth. It will detect metal particles no matter how deeply they are buried in the material under inspection.

At present, the detector is used for the inspection of materials and products in both the unfinished and the finished states, in either bulk or packaged form. Plastics, rubber, textiles, food, confectionary, paper, medicines, explosives, tobacco are some of the items now undergoing metal detector inspection as a regular part of their processing. The device also inspects all types of non-metallic materials—glass, ceramics, leather, wood, etc.—for metal particles having a spherical diameter as low as 70 thousands of an inch. The first units have been in continuous operation for more than two years and have given completely satisfactory service.

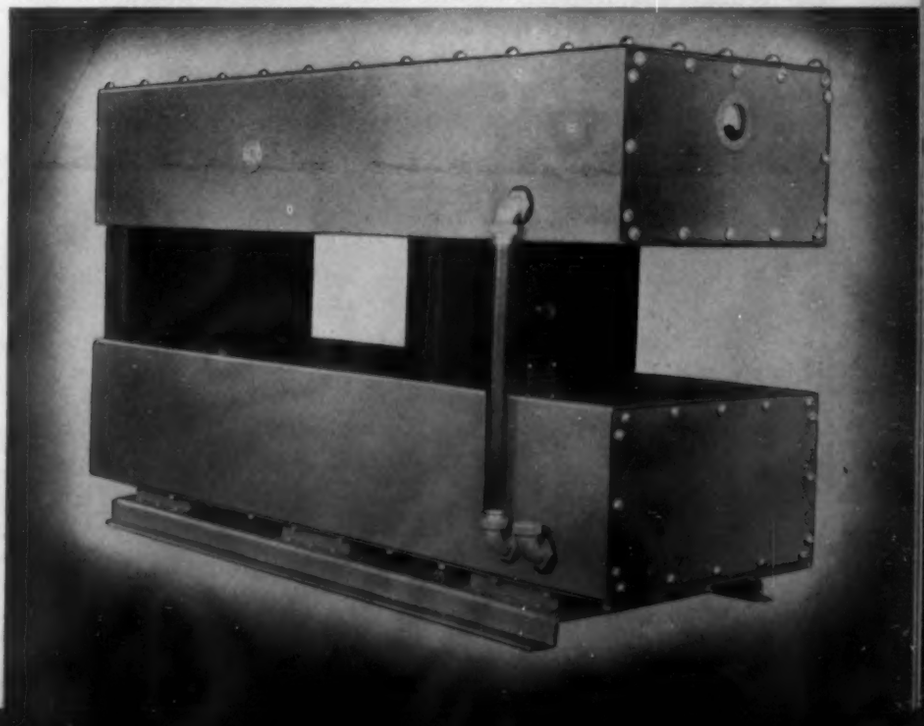
Construction and operation

The metal detector consists of two box-like compartments or heads separated by two Bakelite spacer blocks to form an opening called the inspection aperture (Fig. 1). Except for the plastic panels which form the top and bottom of the inspection aperture, the unit is constructed of aluminum. The material to be inspected is passed through the inspection aperture

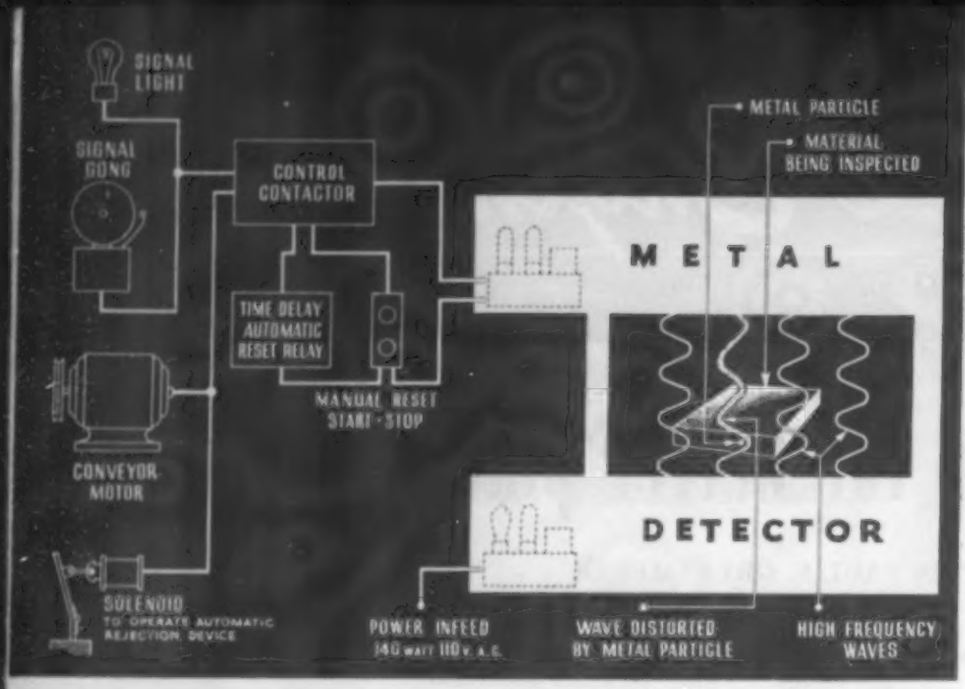
* Reg. U. S. Patent Office.

† Engineering Products Dept., Radio Corp. of America, RCA-Victor Div., Camden, N. J.

PHOTOS AND DRAWINGS, COURTESY RADIO CORP. OF AMERICA, RCA-VICTOR DIV.



1—*The electronic metal detector shown here consists of two box-like compartments or heads separated by two phenolic spacer blocks to form inspection aperture. Material is passed through aperture by a conveyor and is screened by magnetic field set up by coils in plastic panels. Conveyor is halted when metal is detected, or rejector removes the contaminated matter*



2—This schematic diagram shows setup of the metal detector and the principle by which it operates. It may be used for a variety of materials including powders, chemicals, films or sheeting and panels

where it is continuously screened by a high-frequency magnetic field set up by coils imbedded in the plastic panels. When metal is detected, a reaction is caused which triggers a signalling device and either stops the conveyor or movement of the material being inspected or operates an automatic rejector for removal of the contaminated material.

The detector may be employed with conveyor installations at speeds up to 600 ft. per min. with full inspection sensitivity. It may be used as a completely portable unit, may be operated on an incline, may be mounted endwise for tall packages or side-wise for inspecting falling material. It may be employed for bulk material or packaged commodities, for powders, chemicals, drugs, wood-pulp, paper, strip material such as films or sheeting, panels, sand, rubber, bread and flour.

Principle of operation

The lower head of the metal detector is called the oscillator unit; the upper head, the detector unit. The oscillator unit contains a 50-kc. oscillator and amplifier; the detector unit contains a conventional amplifier feeding a detector tube and a thyratron tube circuit. The latter acts as a trigger to operate a reject relay when metal is detected. Two transmitter or field coils are imbedded in the plastic panel in the oscillator unit; a receiver or detector coil is imbedded in the plastic panel in the detector unit. These transmitter and receiving coils are located in the bottom and top of the inspection aperture respectively.

The schematic diagram shown in Fig. 2 will help make clear the principle of operation. The oscillator energizes the two lower or feed coils, which radiate high-frequency electromagnetic waves that travel through the inspection aperture. The magnetic fields established by these two coils are equal and in phase, but opposite in direction. Amplitude distribution can be controlled to obtain balance.

The upper or detector coil is so positioned that it will couple with equal amounts of the magnetic fields established by the field coils. Because the magnetic fields are opposed, under conditions of balance the voltage induced in the detector coil will be zero. The detector coil is connected to the amplifier which feeds the detector tube; hence when there is zero voltage in the coil there is zero voltage on the grid of the detector tube, and the plate current is at maximum. When metal is introduced in the inspection aperture the field becomes unbalanced, a voltage is induced in the detector coil and is impressed upon the control grid of the detector tube. As a direct result the output of the tube drops and changes to a pulsed voltage which acts as a signal.

The output of the detector tube is fed through a coupling condenser to a thyratron tube which, in turn, is connected to a control or reject relay. When metal is detected, the pulsed signal voltage from the detector causes the thyratron to fire and actuate the relay. This relay can be used to operate external devices indicating (or otherwise signalling) the presence of metal. It will stop a conveyor or control the movement of material; will cause automatic marking or rejecting of contaminated products. Normal operation may be restored either manually by means of a push button or automatically by means of the time-delay relay supplied with the metal detector.

Inspection of sisal fiber mats

One of the first commercial installations (Fig. 3) was at the Columbian Rope Co., in Auburn, N. Y., where three metal detectors are used to inspect the entire output of Co-Ro-Lite, a resin impregnated rope fiber plastic material. Assurance that the material in this stage of the process is free from tramp metal provides protection for the dies of the plastic molder. At first, the metal detector was employed in conjunction with the older X-ray equipment originally used for inspection. However, it was soon discovered that in this particular case the X-ray could be dispensed with. Now one girl

performs both the cutting and inspection operations, work which formerly required at least two and sometimes three girls.

In the manufacture of this resin-impregnated sheeting, or web, by the felting process, a needle board containing thousands of needles is employed. The constant vertical movement of the needles in and out of the material occasionally results in a broken needle being imbedded in the felt, or web. It is to detect these broken needles that the detectors are used. Three metal detector installations are used for inspecting the entire output.

As shown in Fig. 3, the felt, or mat, is wound in a large roll for inspection—an ideal means of inspecting plastic film or sheeting, textiles, etc. The Co-Ro-Lite travels through the metal detector inspection aperture by action of motor-operated rollers (center of Fig. 3). After the material passes through these rollers, an operator uses a motor cutter (shown just in front of rollers in Fig. 3) and the Co-Ro-Lite is trimmed.

Metal detector inspection is semi-automatic, that is, the setup is so arranged that detection of metal automatically stops the movement of the material but the operator must push a button in order to restore movement and to restart the inspection process. Provision is made for the automatic marking of the portion of the web containing metal. When the operator pushes the motor-start button, a solenoid valve is actuated for a brief interval, just long enough to deposit a spot of dye on the material. This arrangement is quite similar to the one shown in Fig. 4 which is a completely automatic installation, requiring no attendance whatsoever—only a sensitivity adjustment once a day. In the Columbian Rope Co. installation, the portion of the material containing the dye mark is discarded by the operator when it reaches the motor operated cutter.

The plant superintendent estimates that absence of needles, which formerly damaged dies, has probably saved several thousand dollars yearly. This compares favorably with a cost of $2000 for the metal detector. (The X-ray equipment costs $5000). Further, the quality of the Co-Ro-Lite is better when the detector is used because, being electronic, it is entirely independent of human observation and judgment. In contrast, it is believed that inspection by means of X-ray, because of the human element, missed enough of the metal to make this method of detection impractical.

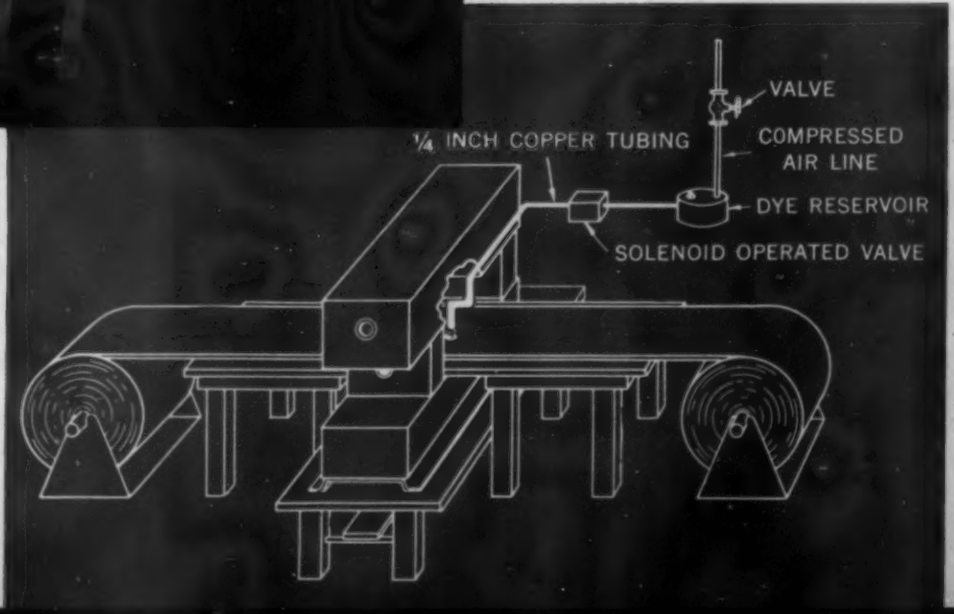
Processors of plastic film or sheet material could probably employ an arrangement similar to the one in this plant, should it be deemed desirable to assure a metal-free product. The day is not far away when purchasers of plastic sheeting and films will insist upon some guarantee that the material is uncontaminated.

Metal detection in record production

The installation in Fig. 5 has been in operation for about two years for the inspection of plastic biscuits prior to putting them into a record press. The plastic used in this work is a vitrolac compound and sometimes it contains metal particles which cannot be seen with the eye yet can do damage to the matrix used in the press. Thus the use of the detector protects the processing equipment at the same time that it insures product quality. *(Please turn to next page)*



3—A resin impregnated sisal fiber plastic material is being checked at left for imbedded broken needles

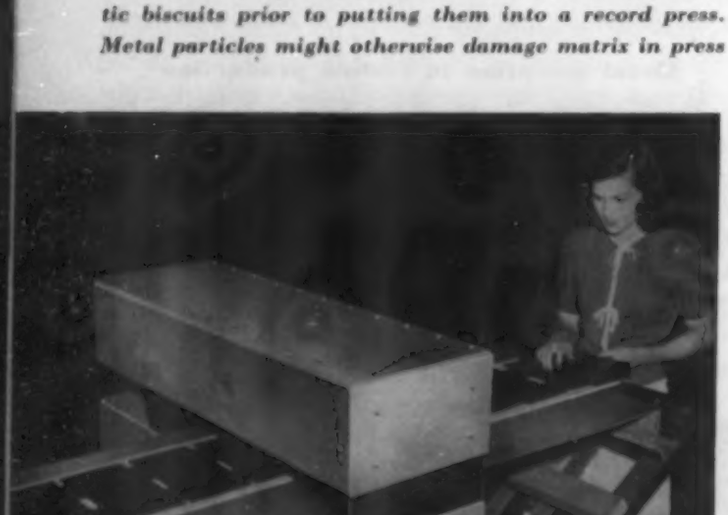


4—In this setup for the inspection of continuous strip material (similar to unit in Fig. 3) a solenoid valve releases dye, powder or chalk to mark approximate place of contamination when the metal particles pass through the inspection aperture

In this particular instance, a full-time operator is employed to feed the biscuits onto an endless belt which carries them through the inspection aperture of the metal detector. When tramp metal is detected, the belt automatically stops and the operator removes the contaminated preform. She then pushes a button to restart the belt and continue the inspection operation.

During a typical inspection period covering 21 working days, exactly 124,994 biscuits were inspected—182 of these were rejected by the metal detector and, upon being broken open, were found to contain tramp metal. Many kinds of metal were detected: iron, tin, copper, aluminumm, lead and steel. The savings during this period were calculated to be $1274—covering 182 matrices at $7 each. In a year such savings would amount to about $15,000, considerably more than the cost of installation and operation. In addition, this detection promotes the manufacture of a high-quality product and serves to protect the company's name and good-will.

5—Another use for the detector is in inspection of plastic biscuits prior to putting them into a record press. Metal particles might otherwise damage matrix in press



An installation in a material plant

The Bakelite Corp. has installed a metal detector in its Bound Brook, N. J., plant to assure that certain types of plastics are metal free and it is planning to install a battery of five detectors in another plant for the inspection of Vinylite molding powders before processing them into plastic sheet. The actual Bound Brook installation is pictured in Fig. 6. The general operating principles of this setup are illustrated in Fig. 7.

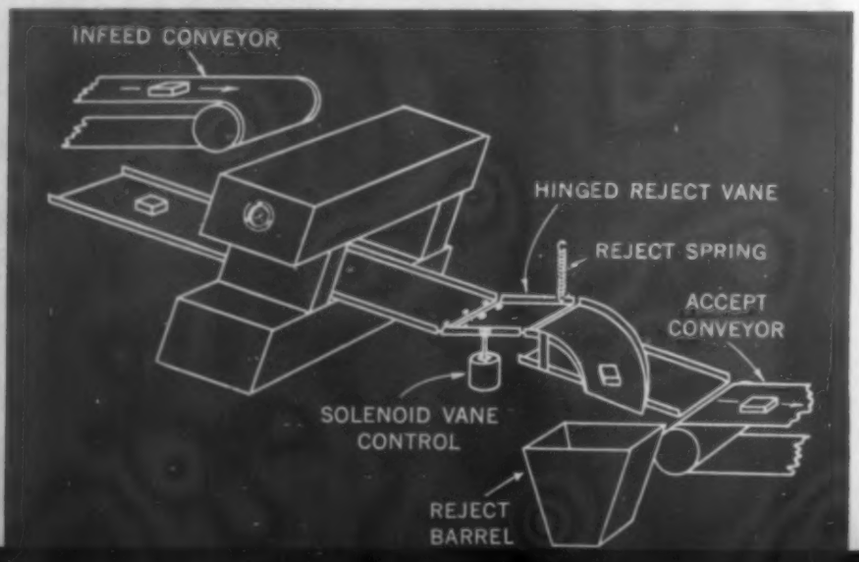
An infeed conveyor brings one biscuit (plastic preform) per second and deposits it on the chute which leads through the inspection aperture. In this particular arrangement the metal detector is mounted at an angle, which may be done without affecting sensitivity or operation in any manner. If a biscuit is metal-free it slides on to an accept conveyor and continues through the normal processing routine. When metal is detected, a reject vane in the chute pops up and the contaminated biscuit slides into a reject barrel. The installation is arranged for completely automatic operation; no operator is employed.

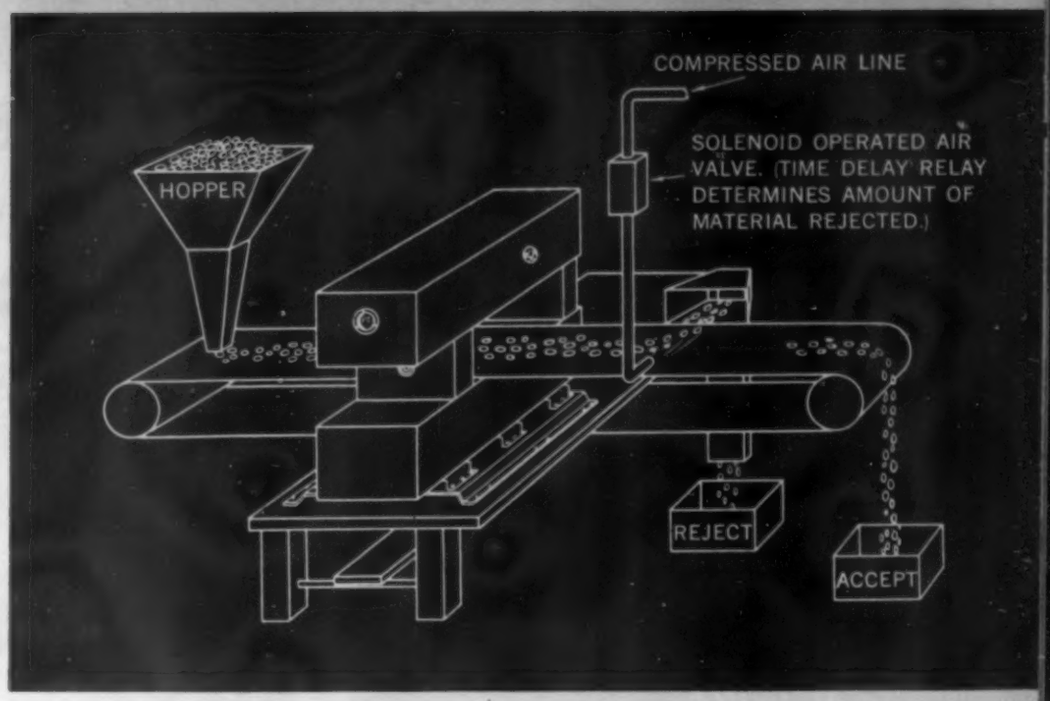
The reject vane, shown in the up, or reject, position in Figs. 6 and 7, is normally down, being held in that position by an energized solenoid. Upon detection of metal the solenoid is de-energized and a spring pulls the vane sharply upwards. After the contaminated biscuit is rejected, a time-delay relay re-energizes the solenoid, the vane is pulled down and normal operation follows. Should the power fail, the reject vane goes up and all biscuits are rejected until normal conditions are restored.

In terms of customers' benefits it is sound business practice for a supplier to the plastics molder or fabricator to perfect his product to the point at which it is uncontaminated by tramp metal. Producers and suppliers of molding powders, fillers, resins, will find this is one way of building a better business—by having a

6—(Below) Detector allows inspection of material on inclined chute. 7—Diagram of unit shows how control solonoid normally holds reject vane down for metal-free material. If metal is detected, vane is raised as shown





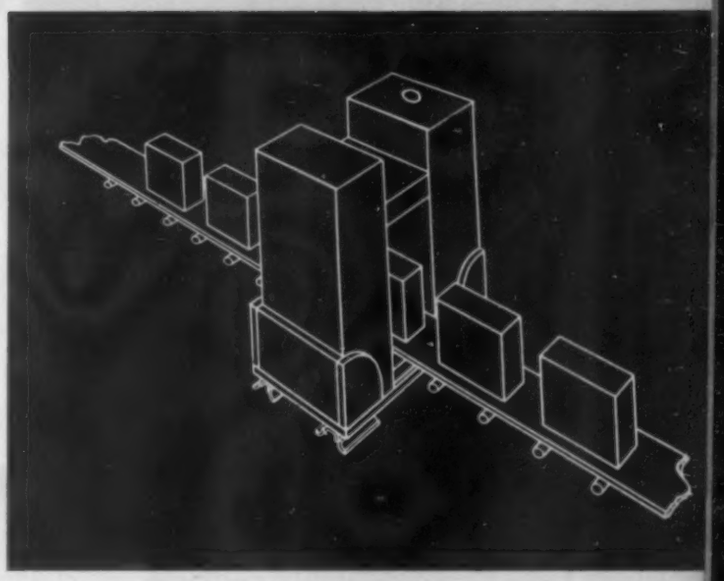


8—In this setup for inspection on a conveyor belt compressed air is used instead of a reject vane to eject any material which contains metal pieces

reputation for the production of quality products.

For the plastic molders and fabricators to be able to buy from suppliers on the basis of specifications guaranteeing metal-free bulk material is both a new and needful condition from which the whole plastics industry would benefit. A great deal of money is represented by the molds, calenders, embossing rollers, engraved plates, etc., that are employed in plastics processing and it should have protection from tramp metal.

Almost any kind of setup may be arranged to suit the needs of the individual plant. Take the arrangement in Fig. 8, for example, devised for suppliers who want to inspect bulk material on a continuous belt with completely automatic operation. This can be modified in many ways. For one thing, the material could be fed onto the continuous inspection belt by means of an infeed conveyor, and metal-free material could be delivered from the belt via an outfeed conveyor. Or the arrangement could be modified for semi-automatic operation with manual removal of rejected material. Again, the bulk material could be passed through in small boxes or packages, with rejects either automatically or manually removed. The metal detector may be mounted end-wise, as in Fig. 9, if the material is to be inspected in large sacks or in tall upright packages. Two other possibilities involve sliding the material down a chute equipped with reject vane (Fig. 7) or mounting the metal detector sidewise and allowing the material to fall through. This latter method may also be completely automatic as shown in Fig. 10.



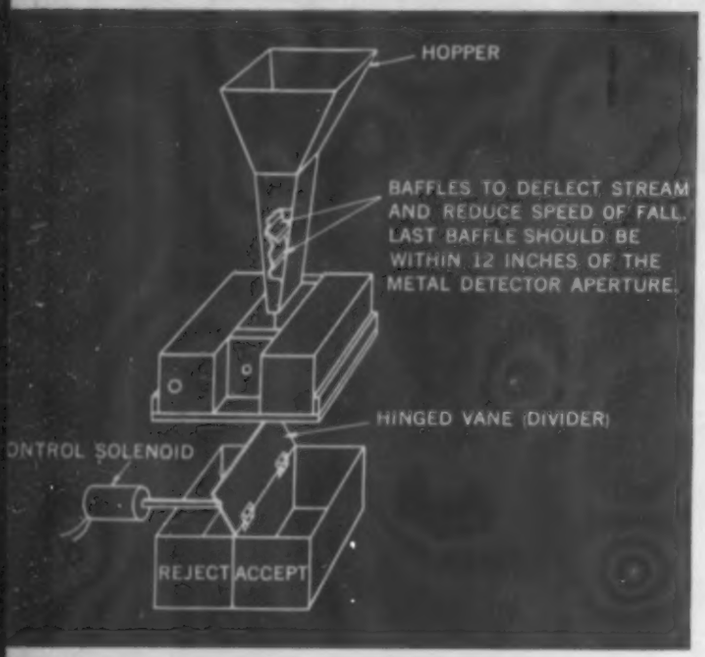
9—When impractical to lay tall narrow packages on their sides, a special cradle supports the detector on its end

Inspecting scrap plastics

The national Automotive Fibre Co., a processor of such plastic scrap as Vinylite and Koroseal, mounts its detector in the regular horizontal position with a motor-driven endless belt being employed to carry the plastic through the inspection aperture (Fig. 11). As is well known, quite a bit of tramp metal accompanies scrap material. The larger pieces can be detected by visual examination and easily removed manually; or a magnetic separator may be employed for automatic removal. Quite a problem presents itself, however, as small pieces, such as staples, may pass unobserved or may be buried too deep for magnetic separation. The metal detector takes care of the smallest pieces, buried particles and magnetic as well as taking care of non-magnetic metal.

In this particular plant, as in many plants, the scrap is first gone over by hand and the larger and more prominent pieces of tramp metal are removed. Then, after the plastic has gone through the milling roller, but before it goes into the calender, it is passed through the metal detector in the manner and form shown in Fig. 11. Should metal be detected, the roll is unwound and examined visually. If the metal cannot be located quickly by this means, the plastic is cut into strips and each strip is tested individually by the detector. In this

manner the search is narrowed down and in a very short time the unwanted metal eliminated. Just about the first day this installation went into operation it detected a piece of metal large enough to have necessitated the regrinding of the calender roll at a cost of about $2000. Thus it paid for itself by just this one operation.



10—In this setup of metal detector for falling material, a hinged vane may be employed to deflect the stream of material sliding down a chute into reject or accept bins

Table I—Inspection Aperture Height vs. Sensitivity to Metals

Sensitivity[a]	*Aperture height*[b]		
	4 in.	*7 in.*	*12 in.*
	in.	*in.*	*in.*
Ferrous metals	0.070	0.090	0.190
Non-Ferrous metals	0.130	0.150	0.30

[a] Sensitivity measurements are in each case the minimum spherical diameter of a particle of metal which would be detected. Of course, in the case of a wire or pin the diameter would not be the determining factor, and could be considerably less than these quantities.
[b] The length of active inspection aperture for all aperture heights is 25 inches. The overall length is 27 inches.

Metal sensitivity

The detector is vapor-proof, dust-proof, and spláshproof, making it suitable for inspection of combustible as well as non-combustible materials. It may be operated with safety in dangerous atmospheres—there are no exposed electrical connections. When purity standards require the utmost in cleanliness, the equipment may be hosed and scrubbed without any detrimental effects. It is unaffected by normal humidity and temperature changes. Regular factory personnel can operate it or it may be set for automatic operation. An operator need check sensitivity adjustment only about once a day.

The inspection aperture is adjustable in height to meet product requirement. Sensitivity may be controlled by both aperture height and a sensitivity control. Thus it is possible to have the detector bypass metal particles less than a predetermined size. Table I shows the various inspection aperture heights available as well as the sensitivity relationship.



11—For inspection of plastic scrap here, the detector is mounted in regular position. There is greater hazard for tramp metal in scrap material than is apparent in processing new material. Metal detector will insure scrap free of metal



Trumpet mutes, made from polyester resins reinforced with glass fiber flock are typical of the hollow articles with a small hole that can be produced by this new method. Moldings without holes can also be made in this manner, as shown by sample molding at extreme left of picture

Molding hollow thermosetting products

by GEORGE W. DEBELL*

RECENT research and development now make possible the economic production of one-piece hollow thermosetting articles without any hole (as a ball) or with a small hole (as a bottle). For several years hollow articles have been made from thermoplastics by blow molding, but the economic production of such parts from thermosetting materials has not, until now, been realized.

While the details of the new process cannot as yet be divulged, it can be said that the resulting products are similar to slush molded metal or thermoplastic articles in that the external contour is accurately controlled by the shape of the mold while the internal contour varies slightly from piece to piece. In slush molding metal and thermoplastic materials, it is always necessary to provide a hole through which the excess material can be drained out, but this new molding process eliminates the need for the draining operation.

Until now thermosetting plastic articles such as the musical mute shown above had to be assembled using two or more molded parts and this entailed not only additional complication in molding but also the problem of matching the parts to each other and assembling them. Sometimes such assemblies could be riveted or screwed together, but often adhesives had to be used.

By this new process, these products can be completed in a single molding operation. Although the raw materials used in the new process are more expensive than the phenolic molding materials, this differential is, in a majority of cases, more than offset by the elimination of the assembly costs.

The trumpet mutes shown above (molded by George DeBell for Micro Musical Products Corp. of New York City) were made from Plaskon polyester resins reinforced with Fiberglas flock and pigmented to obtain the desired colors. The polyester was modified to facilitate use in this process. It is anticipated that other resins of the polyester type can be used with equal facility but to date tests have not been completed to determine the most satisfactory formulations.

To produce a mute from either thermosetting or thermoplastic materials by normal methods would require the production of two molded parts. As the mute is subjected in use to extremely high-frequency vibration, it is problematical whether a permanently satisfactory adhesive joint could be obtained in mass production. Dry spots or looseness in the adhesive joint would produce objectionable sound effects and create considerable consumer resistance to the use of plastics in this application. With the one-piece construction, these assembly and tonal problems are eliminated.

Either single or multiple cavity molds may be used in this method of molding, depending on the shape and size of the articles and on the production volume required. At present, the products can only be produced in opaque colors, but it is hoped that further research in raw materials will eventually permit manufacture of transparent and translucent items. Inserts of certain types can be incorporated in the molded article, and molded holes can also be included.

Up to the present, cure times under 5 min. have been attained and it is anticipated that these cure times will be further reduced as modified types of raw material become available. Only the future will show how much improvement can be made in this direction. It is expected that the future will also lead to still further improvement in impact strengths. The fact that the material is thermosetting is also of advantage from the standpoints of heat and solvent resistance.

The trumpet mutes are the only item in regular production, but expansion of the present manufacturing facilities is contemplated, so that this process can be used for the manufacture of many plastic items.

* Consulting engineer.

TOO HOT! SAYS THE THERMALARM

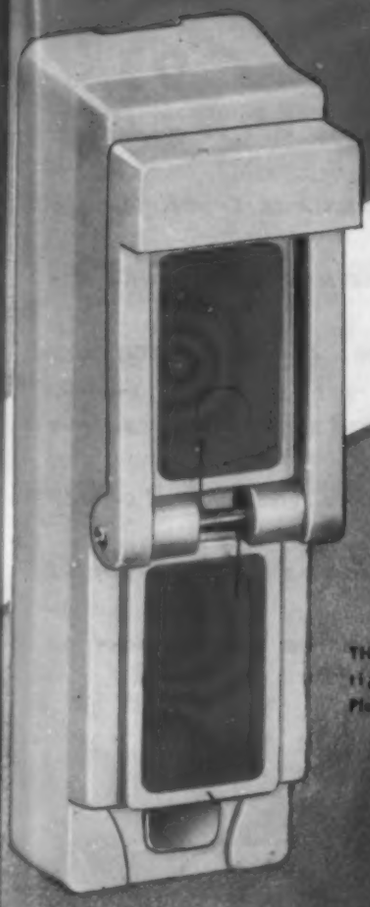
WITH ITS WARNING *Red*



THERMALARM with flag down

The THERMALARM is a product of the Eastern Specialty Company, Philadelphia, Pa. Molded by Lance Manufacturing Company, Philadelphia, Pa.

PLASKON SIGNAL



THERMALARM with flags tipped, showing red Plaskon Molded Color flags

Rapid expansion of electrical demand has placed upon transformers a heavy load. They are the most feasible points at which to determine loading conditions along particular points in a system. The Tesco THERMALARM permits this constant checking by its signal of red Plaskon Molded Color plates which flash into view when the transformer operates at an excessively high temperature. The red plates and the THERMALARM mechanism are contained in a housing made of ivory Plaskon molding compound.

Major advantages of this efficient safety unit: the Plaskon plastics used offer high visibility from the ground; are resistant to heat, cold, rain; have high dielectric strength; are non-conductors; and can be economically molded. Write for free booklet showing many practical advantages of Plaskon* urea-formaldehyde and melamine-formaldehyde molding compounds in electrical manufacturing.

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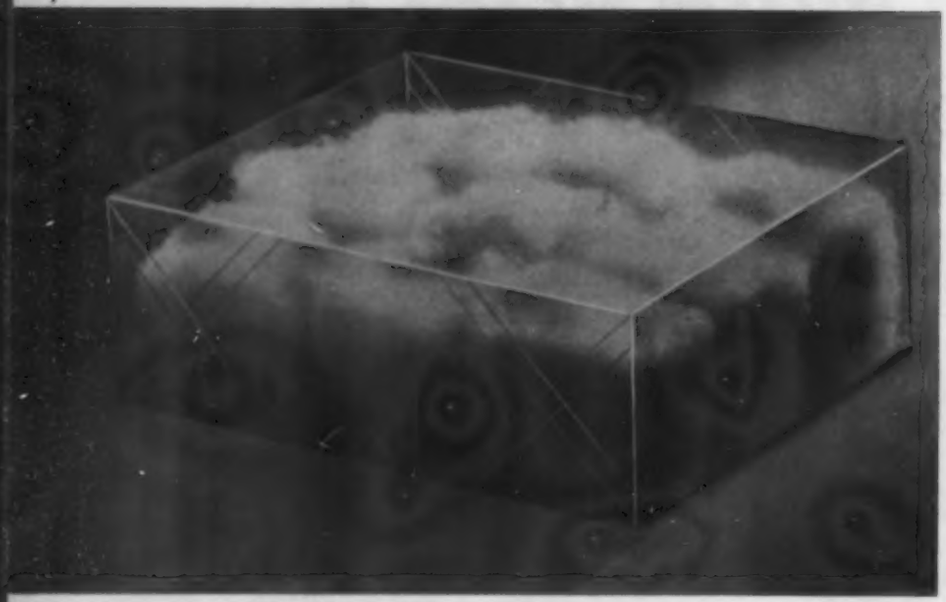


★ ★ ★ **PLASKON** ★ ★ ★

TRADE MARK REGISTERED

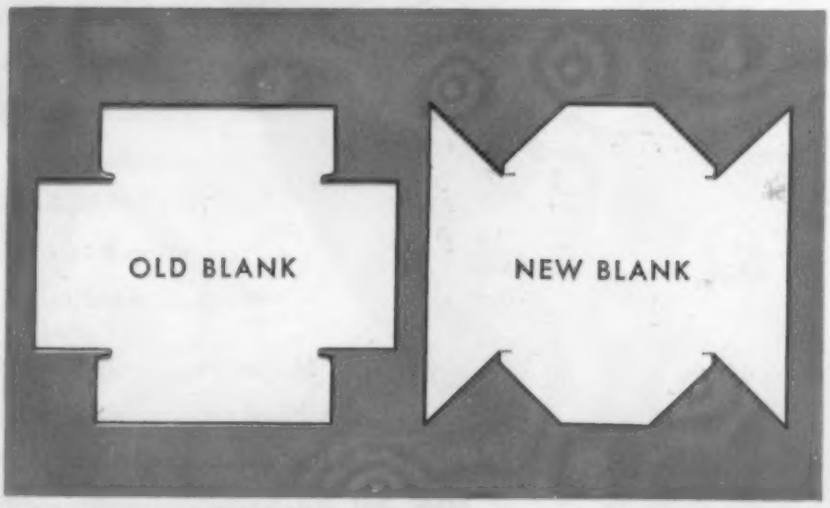
MOLDED COLOR

X design for transparent



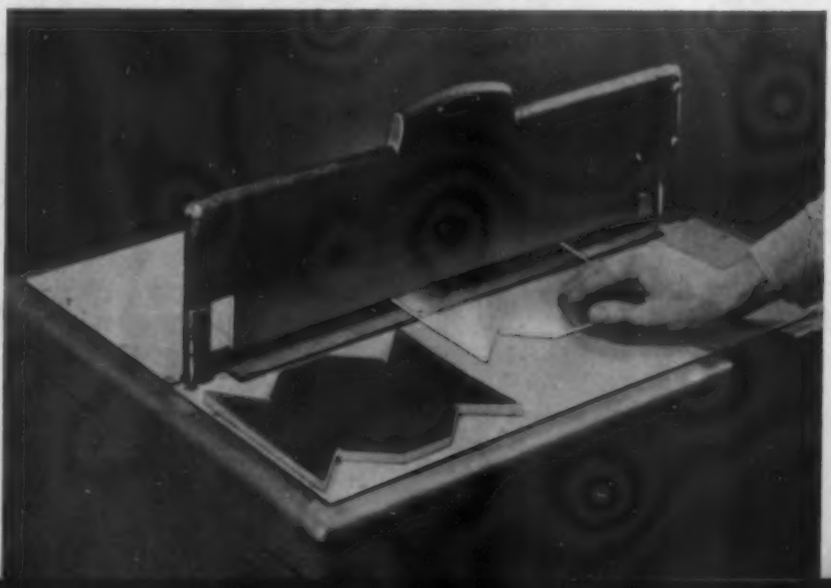
Advantages of new design for blanks cut from plastic sheet include improved appearance through angular seams and tight corners, less hand work, faster and easier production without special equipment or more material

Above—The X box gets its name from the X'es formed (when the cover is in place) by diagonal seams of top section crossing those of the bottom section. Only a few minor changes in box-making machinery are necessary for forming of this box



Right—Dies for conventional box blank are difficult to cut because of the precise curves required at the four corners. Since the new X box design requires no complicated line cutting, the dies are easier to make and also less expensive

Right—To fold the X box blank, the bar creaser iron is reversed so that the beveled edge is facing toward the back of the creaser. The creaser must strike precisely on the two small cuts, or guide lines, that are positioned at the corners



plastic boxes

WHAT is believed to be a new basic transparent plastic sheet box design which will be easier and quicker to manufacture than conventional transparent boxes has been developed by the Kodapak demonstration laboratory, Eastman Kodak Co., Rochester, N. Y.

Known informally as the *X Box* design, since the diagonal seams of the top and bottom cross to form that letter, the box can be produced easily by any manufacturer with only a basic change in the blank from which the box is shaped and minor adjustments in machinery. Instead of a conventional heavy cross pattern, the new blank is a rectangle from which a *V* has been punched at each end of the longer sides.

The following advantages in manufacture are achieved by this change in blank design:

1. It is easier to position blank for last two folds.
2. The new blank permits a greater production rate, particularly in the heavier gages of plastic sheet, since less hand work is required.
3. The new box has tighter corners.
4. The new box has a better appearance and cleaner corners, since angular side seams give smarter lines.
5. It is easier to make precise steel rule dies for cutting blanks since the new die is composed entirely of straight lines.

No special equipment is required for fabrication and no additional material is required with the new design to form boxes of sizes comparable to those made with previous designs.

Changes in equipment and handling

In the fabrication of the new box, experimentation at the laboratory has revealed that a slight change in the bar creaser—wherein the creasing bar is reversed so that the beveled edge is away from the operator—is necessary for maximum speed and precision in production. This slight alteration in the creaser facilitates manufacturing operations since the first two folds, down the longer sides, must be made precisely along the line of the small slits at each corner. This calls, of course, for the exact positioning of the spacing shoulder so that the crease will always fall at that point. However, once such an adjustment has been made, production can proceed with considerable rapidity.

The maximum time saving is achieved during the making of the last two folds since no hand work is necessary to protect the sides of the box which have already been formed. In conventional transparent box manufacture it has always been necessary for the creaser operator to hold back the sides already formed to prevent further creasing of those sides at the ends. With the new *X Box* blank, the ends to be shaped need only be placed in position against the spacing shoulder and the crease made. The *V* shaped cut in the new blank design almost self-positions the blank and eliminates unwanted extra creasing of the sides because it helps guide the creasing bar into position.

The diagonal cut of the ears and sides gives a slightly longer strip to cement than the vertical ears of the standard box design. Cementing, however, can be readily accomplished by clamping a metal plate across the mandrel, by equipping the plate with fingers for holding the flaps in place and by adding a small metal shoulder to the plate against which the ears and sides can be brought into perfect alignment.

The boxes produced by this new design are of greater uniformity as to size and shape than transparent boxes of previous designs. Consequently, a snug top may be produced with greater certainty of a consistently good fit than in the past.

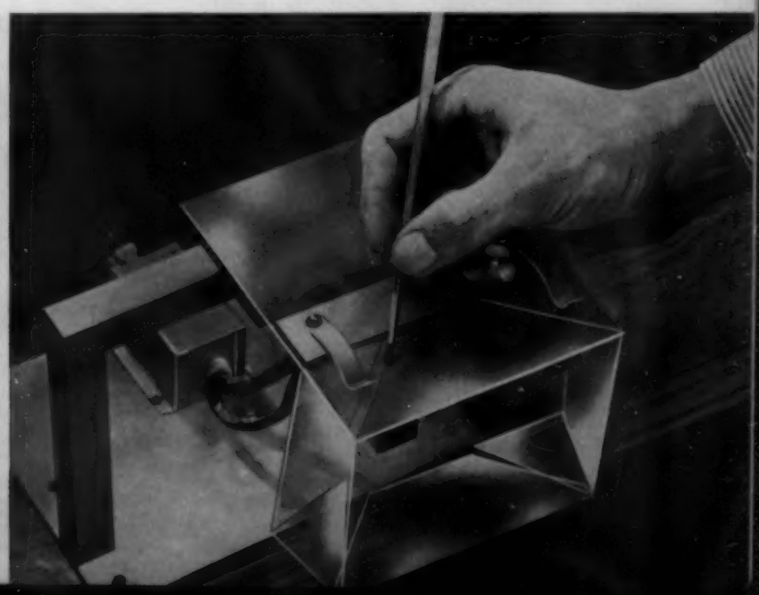
In suggesting the new transparent box to manufacturers, the company states that no patent infringement search of the box and blank design had been made, but a short novelty search disclosed no prior claims.

V cut made by the ears and sides of the partly formed box, automatically position the blank for further folding

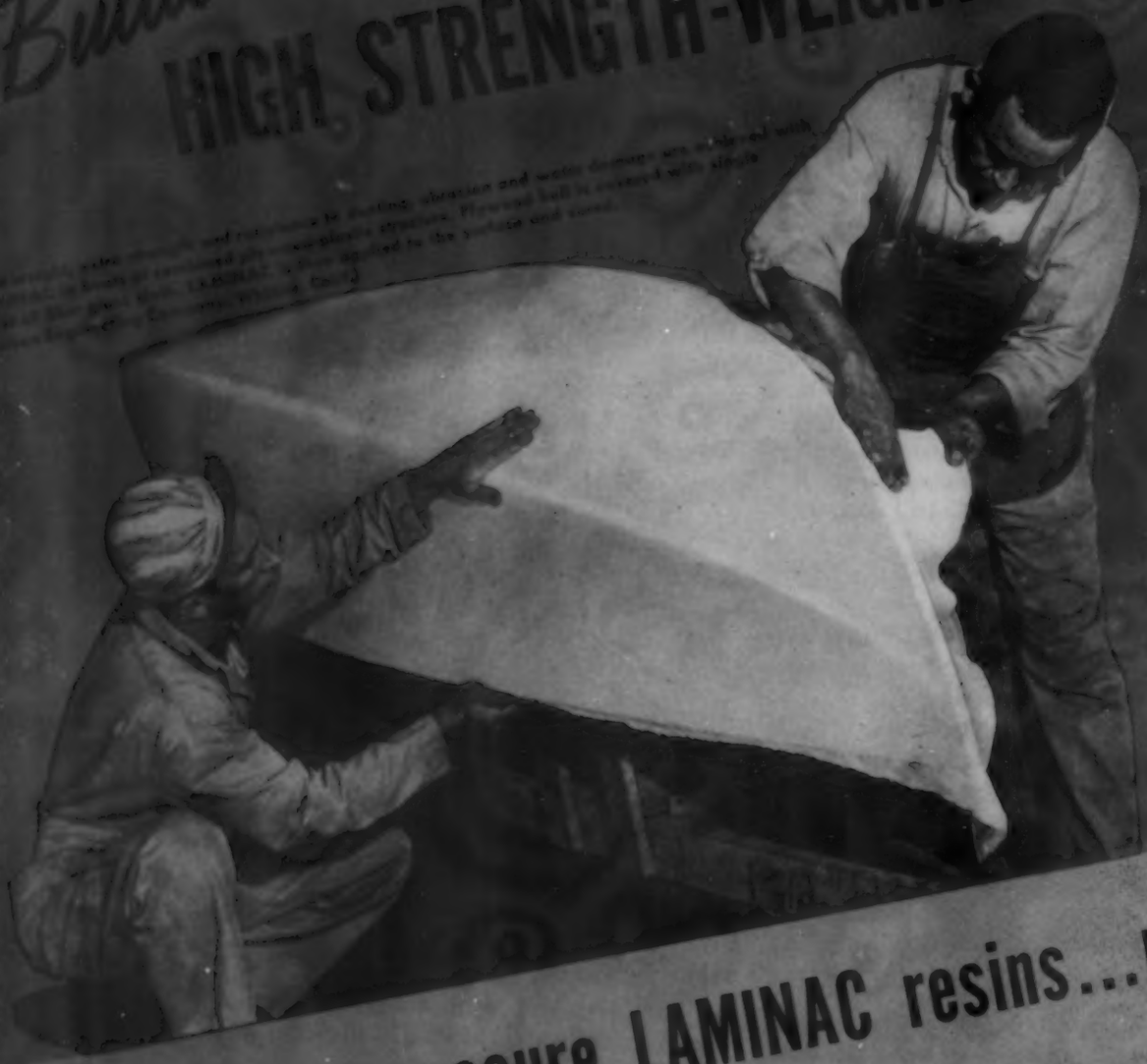
Cementing of both sides of box is rapidly accomplished with the assistance of a clamping and holding jig

PHOTOS, COURTESY EASTMAN KODAK CO.





Build HIGH STRENGTH-WEIGHT RATIOS



. . . with low-pressure LAMINAC resins . . . new

DURABLE... High structural strength with light weight is provided by LAMINAC resin laminates and moldings... they withstand repeated heavy impacts without denting or cracking; assure sustained rugged resistance to wear, tear, and adverse weather.

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ECONOMICAL... The comparatively simple technic of low-pressure laminating and molding with LAMINAC does not require costly equipment. Due to moderate tooling expense, LAMINAC resin parts reduce the cost per unit to a practical level when production quantity does not warrant heavy tool investment. Consequently, design changes are possible at moderate expense.



Weighing only 12 lbs. apiece, fenders for the Kit Kemper Trailer are easily and inexpensively formed with a glass mat and jute sandwich impregnated with LAMINAC and cured on a male and female mold. (Willis and Roberts, Arcadia, Calif.)



Decorative results long associated with LAMINAC formulations, for example, translucent or opaque colors, [illegible] thicknesses and degrees of [illegible] (Reproduction Moulders, Inc., North Hollywood, Calif.)

multi-purpose semi-structural materials



For this "Autoette," electric cruise-about, large sections are molded over inexpensive forms merely by laying up and curing layers of fiber glass cloth impregnated with LAMINAC. Result . . . an extremely durable structure, light weight and highly resistant to denting and weathering. (The Triangle Boat Company, Long Beach, Calif.)

CYANAMID PLASTICS

BEETLE* plastics—urea-formaldehyde thermosetting molding compounds

MELMAC* plastics—melamine-formaldehyde thermosetting molding compounds, industrial and laminating resins

URAC* resins—urea-formaldehyde thermosetting industrial resins and adhesives

MELURAC* resins—melamine-urea-formaldehyde thermosetting resin adhesives and laminating resins

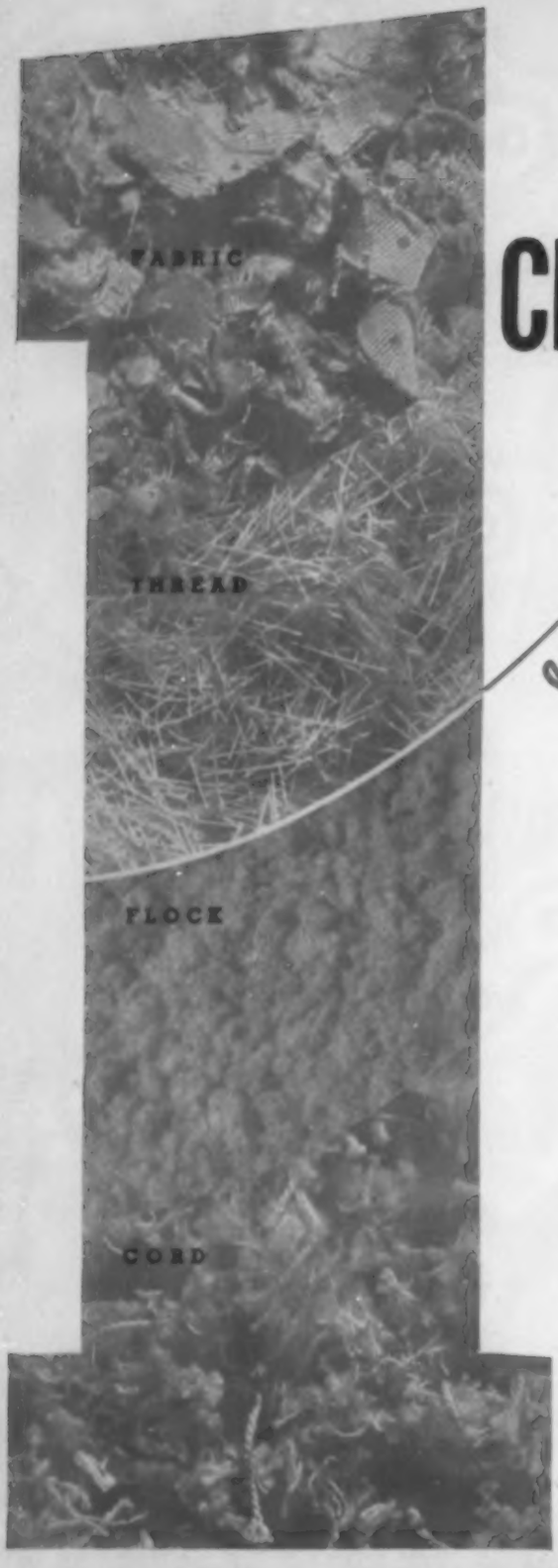
LAMINAC* resins—thermosetting polyester resins

PHENAC* resins—phenol modified resorcinol thermosetting resin adhesives

*Reg. U. S. Pat. Off.

If you are designing or building a structural unit . . . ask for information on LAMINAC low-pressure laminating resins . . . Plastics Division, American Cyanamid Company, 32 Rockefeller Plaza, New York 20, N. Y.

Cyanamid Plastics



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Measuring of surface and volume resistances

by R. I. WITT, J. J. CHAPMAN, B. L. RASKIN*

SUMMARY

1. A three-electrode sample has been devised for measuring the DC surface and DC volume resistance of plastics.

2. The scheme may be applied to samples placed in jars; three isolated connections are brought out through steatite bushings inserted in the metal top. The metal top becomes part of the guard circuit and furnishes a good seal. Such a cell may be made economically in large numbers. Saturated salt solutions, of one centimeter depth in the bottom of each cell, provide various humidities.

3. The electrode configuration proposed allows considerable unpainted surface for the study of attacking atmospheres simulating weather or other effects.

4. Merely measuring *overall* resistance between two electrodes attached to a plastic material is insufficient for the application or improvement of the product. Volume and surface effects merit separate evaluation.

5. Silver conducting paint is available which allows free penetration of moisture into the plastic, while providing low-resistance firmly adhering electrodes. For studies where humidity is of paramount importance, this method eliminates many of the uncertainties inherent in the use of lead foil and petrolatum.

DURING World War II, in the warm humid climate of the South Pacific, difficulties arose in communications and other electrical equipment that emphasized the need for accurately determining the electrical surface and volume resistances of plastic insulating materials. These difficulties were not completely new; moisture has been blamed frequently for the deterioration and failure of electrical insulation even without the aid of ample data.

Surface and volume resistance measurements are equally important in the application and improvement of plastic insulating materials. Existing methods for measuring the DC resistance of plastics do not yield a direct separation of the two quantities. Instead, both are simultaneously involved in the measurement, and separation results only from computation.

Method

The marked distinction the present method claims over other methods is the emphasis placed on the shape of the electrostatic field during each type of measurement. A 2-in. diameter disk of $^1/_8$-in. thick material is sufficient for a measurement of DC surface and DC volume resistance. This sample is provided with three electrodes. A 0.5-in. diameter disk and a concentric ring which is 0.25 in. wide and which possesses a mean diameter of 1.75 in. are painted on one side using a conducting coating. The third electrode, on the other side, is a 1.50-in. conducting disk.

Figures 1 and 2 illustrate the method of placing the electrodes and making the electrical connections. As shown by Fig. 1, the electric field lies in the surface for the determination of that resistance (between electrodes 1 and 2). In this way, a large volume current is prevented from masking the measurement. In an analogous manner, Fig. 2 shows that the surface leakage is prevented from affecting the volume determination. In this case, the electric field goes through the volume of the material for the determination of that resistance (between electrodes 1 and 3).

Many conventional three-connection devices may be used with this sample; in our particular case the three connections were high, low and guard from a General Radio-type 544B bridge. However, the method would be adaptable to the somewhat less portable setup of a battery and wall galvanometer. In this latter case

* Associate professor, research assistant (on leave of absence from the General Electric Co.), and research assistant, respectively, Dept. of Chemical Engineering, The Johns Hopkins University, Baltimore, Md.

Table I.—Effect of Conducting Paints on Absorption of Moisture by a Plastic[a]

Time	*Bare plastic, gain in weight*	*Completely covered with #4635, gain in weight*	*3-electrode coverage with #4635, gain in weight*	*Completely covered with #4133, gain in weight*	*3-electrode coverage with #4133, gain in weight*
days	*percent*	*percent*	*percent*	*percent*	*percent*
1	1.2	1.2	1.2	1.2	1.2
2	1.7	1.8	1.7	1.7	1.8
4	2.3	2.5	2.4	2.4	2.4
8	3.5	3.5	3.3	3.4	3.4

[a] The data represent tests run in a 100 percent relative humidity atmosphere at 25° C. on 2-in. diameter disks of 1/8-in. thick material.

the three connections would be high, low and ground as shown in Fig. 3 (page 244) for measuring surface resistance. Volume resistance may be measured as shown in Fig. 4. Regardless of the measuring circuit employed, electrodes 1 and 3 must be at the same potential for surface resistance, while 1 and 2 are at the same potential for volume resistance.

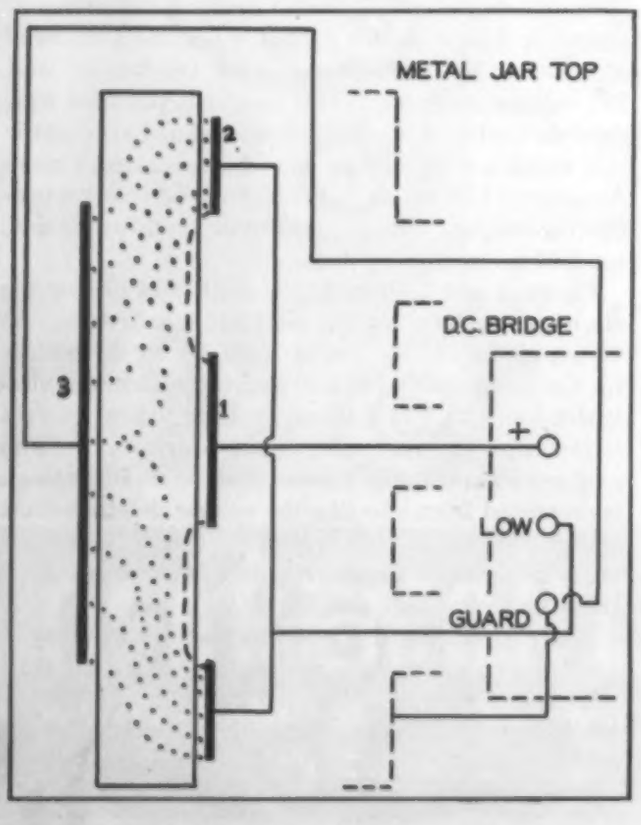
Electrodes

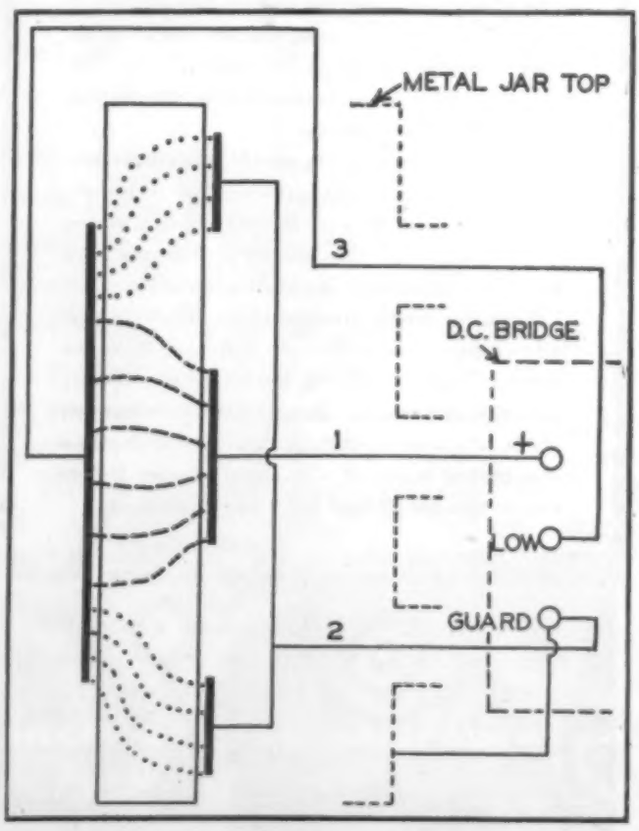
For DC resistance measurements, du Pont #4635 silver conducting paint was found to be satisfactory for a wide variety of laminated thermosetting, molded thermosetting and rigid thermoplastic materials. Other conducting paints that adhere well should be equally satisfactory because for this type of DC measurement a few ohms resistance in the electrodes is of no significance. The solvent dries out of this paint rapidly without affecting the surface of the plastic; in the case of the thermoplastics the solvent should be quickly evaporated by raising the temperature to 45° C. or by vacuum drying at room temperature.

Du Pont #4133 silver conducting paint was also studied to get low resistance coating for high frequency loss factor measurements. A promising technique for spraying electrode patterns and avoiding solvent action has been worked out at Naval Research Laboratory.

In addition to conducting electricity, these paints allow free moisture penetration into the volume of the plastic sample as shown by Table I. These tests were made upon a material that readily absorbed moisture, so that if the paint offered any hindrance it might be found to be widely different from the bare plastic. From the data, it was concluded that both paints were effective in moisture transmission. Each value represents an average of four determinations. Within the accuracy of the procedure, the painted samples gained moisture at the same rate as the bare sample. Thus with this type of painted (*Please turn to page 244*)

1 and 2—Left (1), Method of placing electrodes and making electrical connections to determine surface resistance of plastic material. Right (2), Volume resistance of plastic material is being tested using same connections as at left





Extending resorcinol resin glue with corn gluten

by GLEN E. BABCOCK AND A. K. SMITH*

Corn gluten, a by-product of the wet-process milling of corn, is suitable as an extender for resorcinol-formaldehyde cold-setting glue. The extender has been used in proportions up to 40 percent of the total solids content of the glue without apparent loss in water resistance or gluing properties. A method for the preparation of a suitable resorcinol resin is described.

A description of a method for extending phenolic resin plywood glue with soybean meal or corn gluten was recently published by Babcock and Smith.[1] The authors showed that it is possible to extend the phenolic resin with as much as 40 percent of proteinaceous material to form a glue line which meets all the specifications for a waterproof glue. The proteinaceous materials used for this purpose contain 40 to 60 percent protein and are glues in their own right; for this reason they can be used as extenders in greater proportion than walnut shell flour which is able to serve only as a glue filler. This new process has been in operation for nearly three years in a large hardwood plywood mill and is reported as giving very satisfactory results.

The corn gluten and soybean meal used in the above process are by-products, respectively, of the wet-process milling of corn and the soybean protein industries. These materials normally sell for less than walnut shell flour delivered to the midwest plywood mills. Their use as extenders effects a substantial saving in waterproof glue line costs.

The success attained in extending phenolic resin hot-press glues led to similar studies in extending resorcinol-formaldehyde cold-setting glues, where a still greater saving in glue line costs appears possible. The preliminary experiments showed, however, that corn gluten was more adaptable as an extender for resorcinol resin than soybean meal. This difference in adaptability is explained by the greater dispersibility of the corn gluten in the alcoholic solution of resorcinol resin. In results presented here, corn gluten is the only extender used; however, it is quite probable that other proteinaceous materials containing an alcohol-soluble protein could be adapted to the process.

A description of the properties of resorcinol resin glues was published by Rhodes[2]. Resorcinol resin has been known for many years, but only recently has it been developed into a practical glue to fill the need for a cold-setting, waterproof and moldproof product. Its principal uses have been for constructing boat keels, laminated beams and airplanes, in building construction, and in gluing odd-shaped pieces that cannot be handled well between the flat platens of a hot press.

The reaction of resorcinol (*m*-hydroxyphenol) with formaldehyde is so rapid that it is difficult to control, which may explain in part the slow development of the resorcinol resin glues. Although the resorcinol-formaldehyde reaction is well known, there is little available information in the literature regarding the formation of a practical resin product. It was necessary, therefore, to study the reaction from this point of view and to find methods for its control. Along with studies on the resin formation, methods for preparing the glue and the experimental results obtained on plywood and block shear tests are presented.

Resin and glue preparation

In the present process, the reaction of formaldehyde with resorcinol was carried out by slowly adding the formaldehyde to the resorcinol. As an additional control, the amount of formaldehyde used at this stage is insufficient for the reaction to go to completion. Subsequently, in preparing the glue for use, paraformaldehyde (accelerator) is added to complete the reaction and cause the resin to harden into an insoluble product.

The initial reaction for the formation of a water- or alcohol-soluble resin is carried out as follows: 220 grams of technical resorcinol (2 mols.) are placed in a three-necked round bottom flask and dissolved in 100 grams of ethanol with the addition of 2 grams of benzenesulfonic acid to serve as a catalyst. The flask is fitted with a stirrer, condenser and thermometer. Then 97 grams of 37 percent formalin (1.2 mols.) are added slowly and at a rate that prevents too rapid refluxing of solution. In reacting large quantities of these compounds, external cooling of the reaction vessel is necessary. Caution should be exercised at all times in reacting resorcinol and formalde- (*Please turn to page 250*)

* Northern Regional Research Laboratory, Peoria, Ill., one of the laboratories of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, U. S. Department of Agriculture.

[1] "Extending phenolic resin plywood glues with proteinaceous materials," Glen E. Babcock and Allan K. Smith, Ind. Eng. Chem. 39, 85 (Jan. 1947).

[2] "Resorcin resins and adhesives," by Philip H. Rhodes, MODERN PLASTICS 22, 160 (Dec. 1944).

German thermosetting resins

This article presents more detailed information on the preparation of I.G. phenolic and urea resins mentioned in previous reports. References to the Publication Board reports and to the previous articles in MODERN PLASTICS concerning these resins are cited for each product.

Manufacture of P 600 phenolic adhesive[1]

PHENOL (100 kg.), formalin (150 kg., 30 percent) and sodium hydroxide (2.5 kg. in 7.5 kg. of water) are mixed in a copper or nickel steam-jacketed still, fitted with a stirrer and reflux condenser. The charge is brought to 100° C. (heating-up time approximately 1 hr.) and refluxed for 10 to 15 min. (the usual time is 10 minutes). There is no control other than time on this stage of the process. Pressure is then reduced and nearly all the water (approximately 42 percent of the charge) is distilled off. The total distillation time is normally about 2 hours. The temperature rises from about 45° C. at the beginning of the distillation period to 60 to 70° C. at the termination of the period.

Distillation is controlled by viscosity, the first tests being made after 1 hour. The viscosity of a 50 percent (by weight) solution of the resin in acetone is measured in an Ostwald viscometer at 20° C. The desired viscosity is 7, which means that the viscosity of the resin solution in acetone is seven times that of pure acetone under the same conditions.

When the correct viscosity has been attained, the charge is cooled to about 45° C., and 12.5 kg. paraformaldehyde and 25 kg. acetone are added. The final reaction is again controlled by viscosity measured in an Ostwald viscometer at 20° C. In this case a solution of one part resin in two parts acetone (by weight) is used. The desired viscosity is 250 to 300 sec.; the viscosity of pure acetone under the same conditions is 18 seconds. After the correct viscosity is reached, the charge is cooled to room temperature.

The plant yield is 1.7 kg. from 1 kg. phenol; on a laboratory scale, the yield is 1.89 kg. The price was 1.40 RM/kg. The shelf life of P 600 stored at 10 to 20° C. is 9 to 12 months. After about three months, further slight condensation has occurred resulting in increased viscosity, but this does not significantly affect the use of the glue or the strength of the joints.

[1] "Investigation of German plastics plants, Part 4," by J. W. C. Crawford and T. Love. PB 34032. See also "Plastics in Germany, 1939–1945," MODERN PLASTICS 23, 163 (Dec. 1945).

Manufacture of Asplit resins[2]

Asplit S, which is used in a compound for jointing tiles and bricks and lining tanks when resistance to acids, alkalis and solvents is required, is made with:

825 kg. phenol
1020 kg. 30 percent formadehyde and
160 kg. sodium hydroxide (45 percent solution).

The reaction is conducted in a wooden tank in which the reactants are mixed and stirred. The first stage requires 1½ to 2 days. In the second stage of the reaction, 20 percent hydrochloric acid is added so that the aqueous layer is distinctly acid to congo paper (aqueous layer approximately 0.1 *N* acid). During the addition of the acid the temperature rises to 40 to 42° C. and the mixture is cooled by ice to 30 to 33° C. It is stirred for 1 to 1½ hr. and then allowed to settle for 10 minutes. The resinous layer is run off into a second vessel to which is added sufficient sodium hydroxide to maintain the pH just above 7. Water (60 to 70 kg.) is added and the mixture is returned to the wooden tank where it is stirred to wash out the sodium chloride. The resinous layer is again separated and washed again. The resin is finally separated and 10 percent benzyl alcohol is added. This causes a further separation of water. The viscosity (Hoeppler, 50 grams resin in 50 grams alcohol at 20° C.) should be 15 cp., but is usually 7 to 8. The solids content determined by heating at 100° C. is 70 percent.

Asplit AN is made in the same manner from:

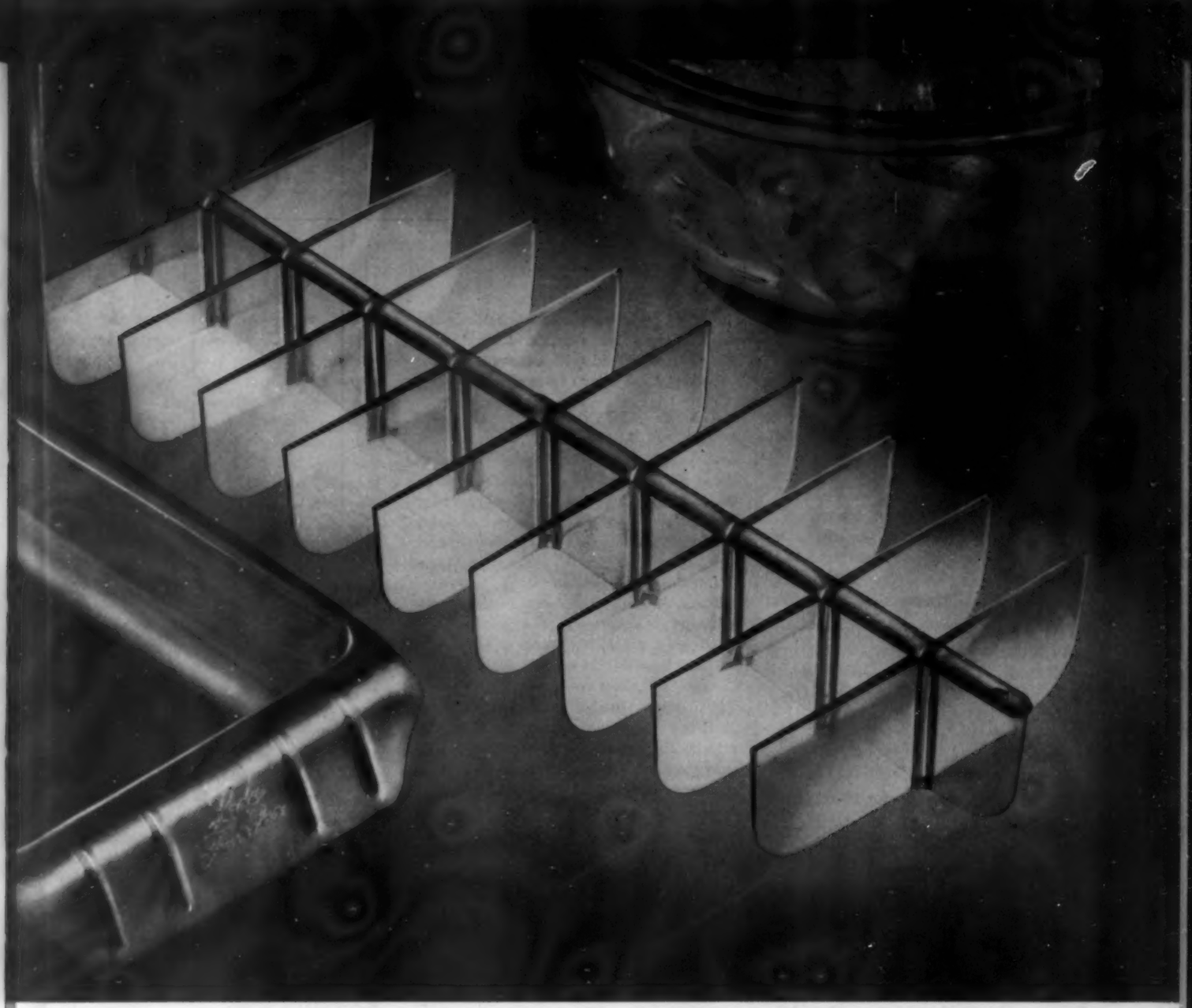
550 kg. phenol
1020 kg. formaldehyde (30 percent) and
160 kg. sodium hydroxide (45 percent).

Manufacture of cast phenolic resins[2]

The resin is made by condensing 100 kg. phenol (100 percent, as pure as possible, delivered in galvanized drums), 250 kg. formalin (30 percent not neutralized) and 4 kg. caustic soda in flakes, in a nickel digestor at 65° C. for 3 hours. It is then immediately distilled until the Ostwald viscosity is 8. Lactic acid (12.5 kg.) is added and distillation continues until the viscosity reaches 9. The mass is then run off into brass trays, each containing 25 kilograms.

The viscosity measurement is carried out by allowing a 16-mm. diameter steel ball to fall through a distance of 250 mm. in a solution of the resin diluted 1:1 with acetone in a 30-mm. tube. The figures represent the ratio of the time of fall in 1/100 min. for the resin solution diluted 1:1 with (*Please turn to page 256*)

[2] "Investigation of German plastic plants, Part 2," by J. H. Rooney, G. M. Kline, J. W. C. Crawford, T. W. M. Pond, T. Love and R. H. Richardson. PB 25642. See also "Plastics in Germany, 1939–1945," MODERN PLASTICS 23, 152 M (Oct. 1945).



Ice-tray dividers molded by Kuhlman Plastics Co., Kansas City, Mo., for Fairfax Engineering Co., Kansas City, Kan.

Flexible at Freezing

ICE CUBES slide easily out of dividers molded of Tenite. A slight finger pressure and a flexing of the tough, resilient Tenite frame are all that's needed to loosen the ice from the smooth plastic surfaces. Furthermore Tenite, which is low in heat conductivity, won't freeze to the fingers.

Tenite gets its super-smooth finish directly from the mold, thus eliminating the need for subsequent polishing. It withstands repeated freezing and defrosting without warping. It can be made in any desired color—a factor that adds considerably to the sales appeal of these transparent, multicolored dividers.

Other uses of Tenite in the refrigeration industry include beverage cooling coils, shelf edging for refrigerators, food-compartment door pulls, and thermostat control parts. A wide range of formulas and flows suits Tenite to many more applications. For information, write to TENNESSEE EASTMAN CORPORATION (Subsidiary of Eastman Kodak Company), KINGSPORT, TENNESSEE.

TENITE AN EASTMAN PLASTIC

Plastics Digest

This digest includes each month the more important articles of interest to those who make or use plastics. Mail request for periodicals directly to publishers.

General

SCRATCH-RESISTANT COATINGS FOR METHYL METHACRYLATE. E. E. Halls. Plastics (London) *10*, 638–45 (Dec. 1946). Scratch-resistant coatings for methyl methacrylate resin are described. The coatings consist of hydrolyzed ethyl silicate and polyvinyl acetate applied by dipping the plastic sheet in solutions. The surface coating is then pressed between the platens of a press and cured with high temperature and pressure. This is a summary of U. S. Patent No. 2,404,357.

THE GROWTH OF PLASTICS EXPORTS. British Plastics *18*, 565 (Dec. 1946). Graphs are given showing the export of manufactured products, synthetic resins, casein plastics, cellulose plastics, synthetic rubbers and raw materials by Britain during the first nine months of 1939, 1945 and 1946. Increases are noted in all categories for 1946.

CARBOXYMETHYL CELLULOSE NOW PRODUCED IN U. S. Chemical Industries 236–7 (Feb. 1947). The syntheses, properties and applications of carboxymethyl cellulose are reviewed.

POLYETHYLENE. Chemical Industries *60*, 219–22 (Feb. 1947). The history, methods of synthesis, properties and applications of polyethylene are reviewed.

SILICONES AS NEW ENGINEERING MATERIALS. W. R. Collings. Trans. Am. Inst. Chem. Engrs. *42*, 455–71 (1946). The properties and applications of the silicone polymers are reviewed.

Materials

VINYL ALKYL ETHERS. C. E. Schildknecht, A. O. Zoss and C. McKinley. Ind. Eng. Chem. *39*, 180–6 (Feb. 1947). The literature related to simple unsubstituted vinyl alkyl ethers is reviewed. New data are presented on the purification and properties of the vinyl alkyl ether monomers. Special attention is given to vinyl methyl, vinyl *n*-butyl, and vinyl isobutyl ethers, which have been made available for development purposes in this country by application of the Reppe synthesis. Correct physical data on these materials are of special interest both because the monomers are comparatively unstable and because their behavior in polymerization is greatly influenced by certain types of impurities. Chemical reactions of the vinyl alkyl ethers include addition to the double bond, hydrolysis and polymerization. Some preliminary work on the polymerization of vinyl alkyl ethers is described with observations on polyvinyl alkyl ethers from abroad.

ALLYL ESTERS OF DIBASIC ACIDS. D. A. Kardashev, N. S. Leznov and V. P. Nuzhdina. Khimicheskaya Prom. *1945*, No. 2, 5–6; Chem. Abstracts *40*, 4559 (Aug. 10, 1946). The properties of diallyl fumarate, maleate, oxalate, succinate, adipate, suberate, sebacate and phthalate are reported. Except for the oxalate, these esters polymerize readily on heating in the presence of benzoyl peroxide to give hard glassy products. The polymers are colorless, have a density of 1.3, are insoluble in organic solvents, are thermosetting and are stable up to 200° C. They are compatible with many plasticizers, but the presence of these materials retards the rate of polymerization. The esters can be copolymerized with methyl methacrylate.

Applications

GERMAN SYNTHETIC ADHESIVES AND OTHER MATERIALS. British Plastics *18*, 539–42 (Dec. 1946). This is a review of a British report on German synthetic adhesives and other plastic materials. The resin products described include phenol-formaldehyde, melamine-formaldehyde, urea-formaldehyde, isocyanates and polyhydric alcohol adipates and phthalates. Several expanded plastics are also described.

GLUES AND GLUING IN PREFABRICATED HOUSE CONSTRUCTION. G. N. Arneson. Wood Products *51*, No. 6, 38, 40, 42; No. 7, 38, 40, 42 (1946). The various types of resin adhesives and techniques for using them are discussed in detail.

POLYETHYLENE PACKAGES IN USE. Modern Packaging *20*, 118–22 (Jan. 1947). The fabrication of packages from polyethylene film is described. This material is readily heat-sealed. It is necessary to coat it with tetrafluoroethylene resin or a silicone fluid to keep it from sticking to jaws of sealing equipment.

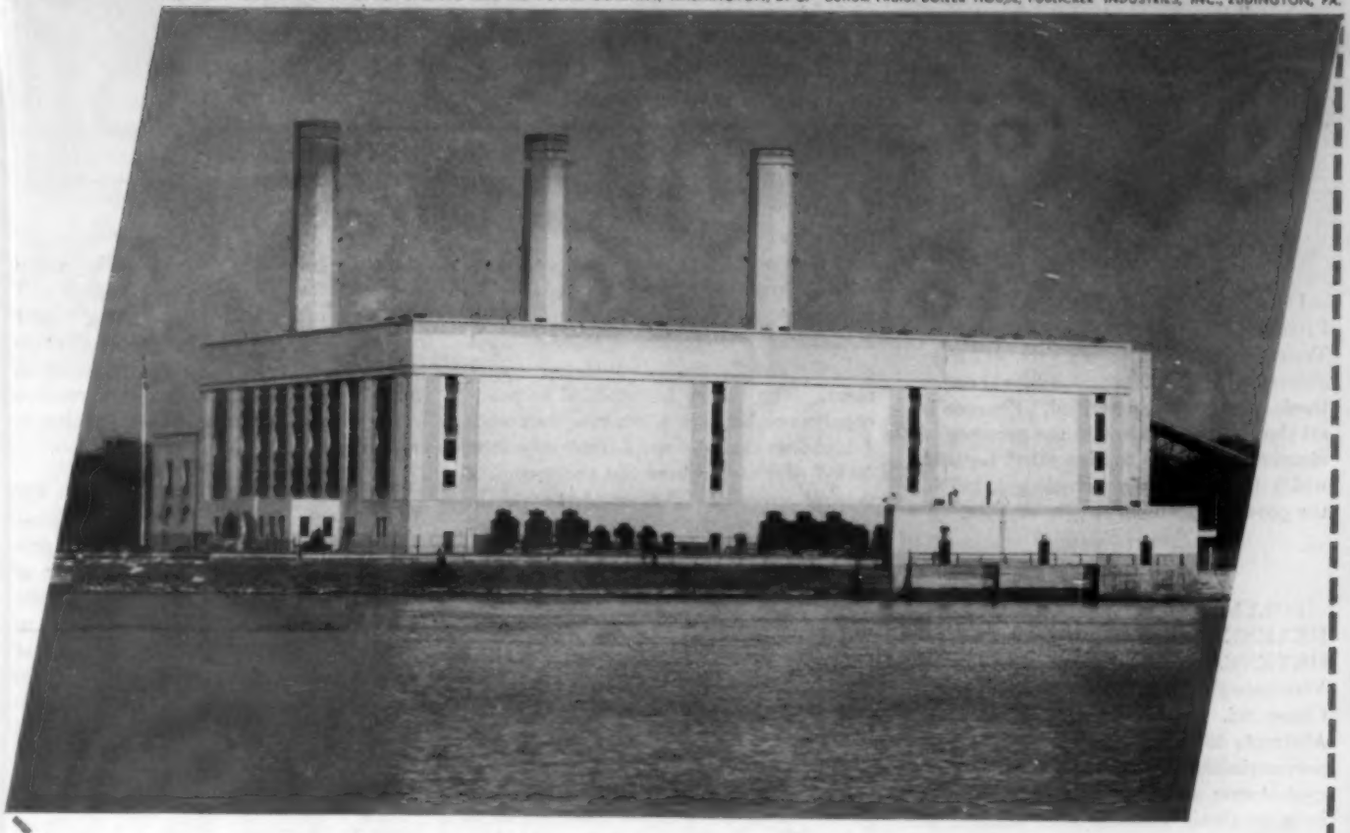
USING SYNTHETIC RESIN CORE BINDERS. H. L. Gebhardt. Foundry *74*, No. 2, 110–12, 198, 200, 202, 204, 206 (1946). Urea-formaldehyde resins filled with fly ash, corn flour, bentonite and sodium, potassium or ammonium fluoroborate are used as core binders in the making of sand foundry cores. The resin should contain 5 to 6 percent free formaldehyde. The advantages are as follows: 1) requires lower baking temperatures to produce a core; the resin cures at oven heat; 2) the resin is easily added by dispersing it in the water; 3) a dense firm water-resistant surface is produced on the core; 4) cleaning room costs are lowered; 5) there are fewer rejects; 6) they are burned out easily and smaller amounts of gas are evolved on pouring in the molten metal.

Coatings

PROPERTIES OF SARAN COATING LATEX. G. W. Stanton and W. A. Henson. Paper Trade J. *123*, 68–72 (Aug. 8, 1946). Applications, formulation techniques and physical properties are presented for a newly developed polyvinylidene chloride coating latex. It is characterized by ease of application, rapid drying and low cost. In keeping with the characteristics of the polyvinylidene chloride family of resins, these coatings exhibit high gloss, clarity, toughness, fireproofness, interesting coloring and pigmenting possibilities, and a high degree of resistance to water, acids, alkalis, oils and organic solvents. This coating latex is used for film-forming and coating compositions in which water is the dispersing and carrying phase. This eliminates the cost, toxicity and fire-hazard which accompany the use of organic solvents formerly required for the application of similar coatings. Due to the absence of chemical affinity between the two phases in the latex, the problem of solvent retention is eliminated and complete drying is readily accomplished. Because of its ability to handle water coating systems, the pulp and paper industry is inherently capable of applying latex coatings. Many machines designed to apply mineral coatings and color pigments to paper have been found suitable for applying and drying latex, but the use of the latex need not be confined to the coating field. Such properties as wet strength, oil and grease resistance, vapor permeability and tear resistance may be improved by incorporation of the latex in the fiber furnish.

MELAMINE. H. F. Payne. Paint, Oil Chem. Rev. *109*, No. 6, 9–10, 12, 36–7, 52 (1946). The history and synthesis of melamine resins are reviewed. The use of melamine resins in protective coatings, in plastic molding compounds, in paper, in textile finishes, in tanning and in the demineralization of water is described.

Top Photo: BUZZARD POINT PLANT, POTOMAC ELECTRIC POWER COMPANY, WASHINGTON, D. C. Bottom Photo: BOILER HOUSE, PUBLICKER INDUSTRIES, INC., EDDINGTON, PA.



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Technical Briefs

Abstracts of articles on plastics in the world's scientific and engineering literature relating to properties and testing methods, or indicating significant trends and developments.

Engineering

DOW PROCESS FOR STYRENE PRODUCTION. J. E. Mitchell, Jr. Trans. Am. Inst. Chem. Engrs. *42*, 293–308 (1946). The Dow process for the synthesis of styrene is described. Benzene is alkylated with ethylene in the presence of aluminum chloride to give ethyl benzene which is catalytically dehydrogenated in the presence of steam to give styrene.

Chemistry

POLYMERIZATION OF CYCLOHEXENE AND VINYLCYCLOHEXENE. N. D. Zelinskiĭ and L. F. Vereshchagin. Bull. acad. sci. U.R.S.S., Classe sci. chim. *1945*, 44–51; Chem. Abstracts *40*, 5025 (Sept. 10, 1946). The polymerization of cyclohexene, vinylcyclohexene and unsaturated compounds in a synthetic gasoline were studied at pressures up to 4000 kg./cm.^{2} and temperatures of 300, 350 and 360° C. The polymerization of cyclohexene is independent of pressure and yields a thermoplastic material. The polymerization of vinylcyclohexene is pressure dependent and the products are insoluble in common organic solvents. The polymerization of the unsaturated gasoline compounds yields oils.

LOW-TEMPERATURE POLYMERIZATION OF HYDROCARBONS. S. E. Bresler. Compt. rend. acad. sci. U.R.S.S. *47*, 410–11 (1945); Chem. Abstracts *40*, 4941 (Sept. 10, 1946). Cold bivinyl with 0.3 percent boron trifluoride does not polymerize until the temperature is raised to −76° C.; the reaction begins suddenly and becomes explosion-like in nature. The same is true of isoprene except that the temperature is −68° C. These autoacceleration reactions are not thermal in nature since isothermal conditions are maintained when the polymerizations are carried out in low-boiling hydrocarbons.

A STATISTICAL THEORY OF DISCOLORATION FOR HALOGEN CONTAINING POLYMERS AND COPOLYMERS. R. F. Boyer. J. Phys. & Colloid Chem. *51*, 80–106 (Jan. 1947). Starting with the assumption of Marvel, Sample and Roy that discoloration in degraded polyvinyl halides arises from polyene structures of the type $(-CH{=}CH-)_n$, a statistical calculation is made of the expected distribution of n values, both for random and for non-random loss of hydrogen chloride. Using the known light-absorption characteristics of polyene compounds, the expected color or light transmission curve of a degraded polymer is computed. Comparison of theory with an experiment on vinylidene chloride-vinyl chloride copolymer indicated fair agreement. The theory is extended to cover copolymers between a reactive monomer (vinylidene chloride) and a stable monomer (ethyl acrylate), where the presence of a neutral group in the copolymer chain greatly reduces the number of long conjugated systems. No color calculations are attempted with copolymers, although a number of quantities related to color are presented in graphical form. The important parameter for copolymers is px, the product of fraction of hydrogen chloride removed and mol fraction of chlorine-containing monomer. All degraded copolymers for which px is the same should have the same distribution of conjugated systems, although not necessarily the same color. The results presented on chlorine-containing polymers and copolymers are applicable to polyvinyl acetate, polyvinyl alcohol and to various other polymers which can lose molecules to form double bonds along the chain.

Properties

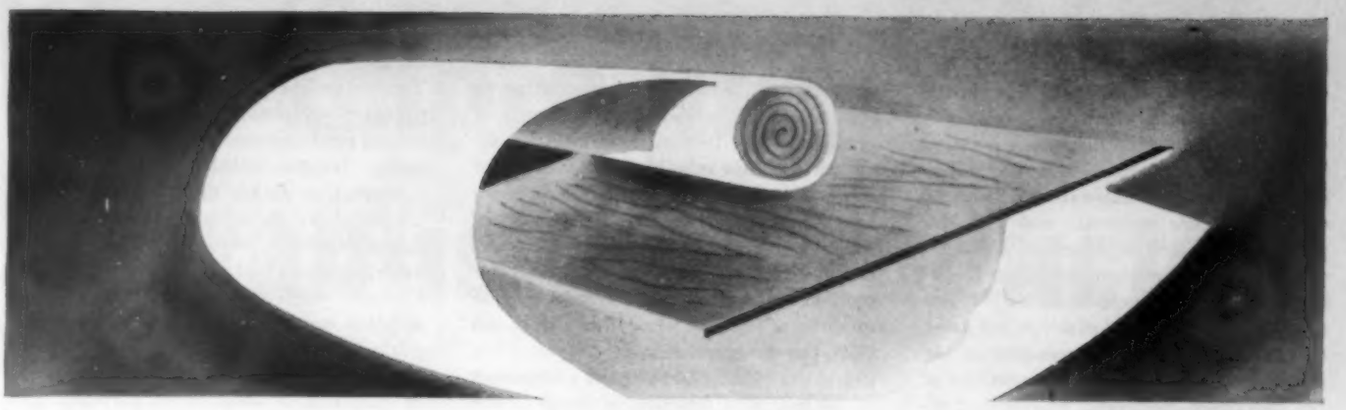
EFFECT OF TEMPERATURE ON THE DECOMPOSITION OF LINEAR MACROMOLECULES BY ULTRASONIC WAVES. G. Schmid and E. Beuttenmüller. Z. Elektrochem. *50*, 209–15 (1944); Chem. Abstracts *40*, 4590 (Aug. 20, 1946). The decomposition of cellulose nitrate in butyl acetate and of polystyrene in toluene by heat and by ultrasonic waves was investigated over the temperature range 40 to 120° C. The decomposition attributed to ultrasonic waves decreases markedly with increase in temperature whereas that attributed to heat increases.

TENSION AND TORSION CREEP PROPERTIES OF CLOTH LAMINATES. J. Marin. A.S.T.M. Bull. *1946*, No. 143, 38–48 (Dec.). Tension and torsion creep-test data on three cloth-based laminates are reported. Creep tests were made for round and tubular specimens and the data were interpreted by three methods—the log-log, the semi-log and the hyperbolic sine methods. A theoretical correlation is given between the tension and torsion creep values based on a distortion energy criterion. This correlation permits the prediction of torsion-creep deformations when creep constants for tension are known. The value obtained for the strength, stiffness and ductility of the three laminates tested show that the relative values of these properties in tension are not the same as for torsion and compression. The relative creep resistance for the three laminates was different in tension than in torsion.

MECHANICAL PROPERTIES OF PLASTICS. R. L'Hermite. Inds. plastiques *1*, 258–64 (1945). The testing procedures for and mechanical properties of phenolic plastics are described. In tensile tests, the load is proportional to the log of the rate of deformation; the modulus of deformation increases from 770 to 1000 kg./mm.^{2} when the rate of deformation is increased from 10 to 1440 percent in 24 hours. The increase in ultimate strength with increased rate of loadings is small; for paper-base laminates, the tensile strength increases from 9.0 to 10.3 kg./mm.^{2} when the rate of loading is increased from 0.4 to 4.0 kg./mm.^{2}/minute. The plastic, elastic and viscous elements of deformation are differentiated by repeated-loading tensile tests. The effect of notches in tensile, bending and fatigue tests was investigated.

DETERMINATION OF THE RELATIVE ACIDITY OF WOOD AND ADHESIVE JOINTS. F. A. DeMarco and E. A. Smith. Ind. Eng. Chem., Anal. Ed. *18*, 775–7 (Dec. 1946). The use of fluorescent dyes as pH indicators for plywood was investigated and found to be impractical. It is possible to determine the relative pH of wood by the use of ordinary color indicators. Experiments prove that the pH of any wood species is closely related to its moisture content and wood structure. The pH of light-colored glues was measured even after setting. Color indicators yield valuable information regarding the pH and the glue penetration in plywood.

DIELECTRIC CONSTANTS OF DIMETHYL SILOXANE POLYMERS. E. B. Baker, A. J. Barry and M. J. Hunter. Ind. Eng. Chem. *38*, 1117–20 (Nov. 1946). Dielectric constants as a function of the temperature of the homologous series of pure trimethyl end-blocked dimethyl siloxanes having from one to seven oxygen atoms were measured. From these constants, together with density-temperature and optical refraction data, the effective dipole moments in the concentrated liquids, the infrared dispersion, and the dipole, atomic and electronic polarizations



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were calculated by means of the Onsager-Kirkwood theory. A special procedure was devised in order to apply this theory to the present case, where dipole moments are small and infrared dispersion is large. Two of the compounds are anomalous since they have a temperature-dependent apparent dipole moment, and this dependence is ascribed to association. A causal relation between the infrared dispersion and the dipole moment is found such that the total polarization per gram of material is almost independent of the chain length, whereas the proportions of the individual electronic, atomic and dipole polarizations may vary from one member to another.

GELATION. W. S. Penn. India-Rubber J. *110*, 737–9, 773–4, 776 (1946). The effects of plasticization on the gelatinization of polychloroprene, gelatin and phenolic resins are reviewed. Twenty-nine references.

IMPROVED MECHANICAL TEST METHODS FOR BETTER PLASTICS DESIGNS. H. M. Quackenbos, Jr. Product Eng. *18*, 113–17 (Jan. 1947). The work to break a specimen in a flexural test correlates better with the actual performance of molded phenolic parts than the Izod impact strength or the flexural strength. Data on notch sensitivity are also presented.

Testing

MOLECULAR-WEIGHT DETERMINATION BY LIGHT SCATTERING. P. Debye. J. Phys. & Colloid Chem. *51*, 18–32 (Jan. 1947). The measurement of molecular weights by the light scattering technique is discussed. The basic theory is developed and experimental techniques described. This is a good review article of the state of progress on this subject.

SOLID POLYETHYLENE GLYCOLS (CARBOWAX COMPOUNDS). C. B. Shaffer and F. H. Critchfield. Analytical Chem. *19*, 32–4 (Jan. 1947). Two methods are described for the quantitative determination of the solid polyethylene glycols (Carbowax compounds) in biological materials. These methods, one gravimetric, the other colorimetric, are based upon a reaction of the polyglycols with the heteropoly acids, silicotungstic and phosphomolybdic. Certain features of this reaction are discussed and evidence is presented to demonstrate its applicability to the estimation of the polyglycols in plasma and urine.

DIELECTRIC IDENTITY TEST FOR PLASTICIZERS. M. A. Elliot, A. R. Jones and L. R. Lockhart. Analytical Chem. *19*, 10–15 (Jan. 1947). A new type of cell and method are described for the rapid determination of the dielectric properties of small samples of plasticizers as a function of temperature. Since these materials have characteristic loss factor–temperature curves that are sensitive to contamination by significant amounts of practically any foreign material, such dielectric data are valuable as an identity or acceptance test. Although the procedure has been applied to some plasticizers in particular, it may be used on nearly all electrically polar organic liquids. The method involves the extraction of a small quantity of the plasticizer from a resin and then the determination of the electrical properties of this plasticizer at a frequency of 10 mc. as a function of temperature. Each type of plasticizer gave a reproducible curve different from that of the others. Simple qualitative chemical tests were found valuable for confirmation purposes on some types of plasticizers. Refractive index determinations gave useful supplemental information.

Synthetic rubber

PERFORMANCE OF BUTYL INNER TUBES. I. E. Lightbown, L. S. Verde and J. R. Brown, Jr. Ind. Eng. Chem. *39*, 141–6 (Feb. 1947). In severe over-the-road service tests, Butyl rubber tubes have been shown to hold air 8 to 10 times better than natural rubber tubes. Test results demonstrate that the maintenance of proper inflation pressure, afforded by Butyl tubes because of their superior air retention, results in an increase in tread life of 10 to 18 percent, depending on the test conditions. It is possible to make Butyl tubes which show less "growth" than natural rubber tubes. Butyl inner tubes age well in service, maintaining their original physical properties better than do natural rubber tubes. This superior aging results in an inner tube with better puncture and blowout (tear) resistance which does, in turn, provide a greater degree of driving safety for the motorist.

MODERN VIEWS ON THE CHEMISTRY OF VULCANIZATION CHANGES. II. ROLE OF HYDROGEN SULFIDE. R. F. Naylor. J. Polymer Sci. *1*, 305–11 (Aug. 1946). A study was made of the reaction of hydrogen sulfide with olefins, including polyisoprenes, with special reference to the capacity of the reagent to react with olefins in the presence of free sulfur. Comparison of the products so obtained with those derived: a) by light-catalyzed reaction of hydrogen sulfide, and b) by reaction of free sulfur with polyisoprenes has greatly assisted the understanding of the course of sulfur reaction which occurs in vulcanization processes.

OXIDATION OF GR-S AND OTHER ELASTOMERS. J. O. Cole and J. E. Field. Ind. Eng. Chem. *39*, 174–9 (Feb. 1947). The effect of air oxidation at 100° C. on uncured natural rubber and on the following uncured emulsion polymers was studied: polyisoprene, polybutadiene, isoprene-styrene and butadiene-styrene. The net effect of oxidation of isoprene polymers was chain scission, whereas cross linking predominated with butadiene polymers. Oxygen uptake and antioxidant consumption during aging of GR-S were measured by direct analytical methods. Aging caused a marked decrease in the antioxidant content of the acetone extract. Changes which occur in the infrared absorption spectra of unsaturated polymers during oxidation are reported. The present theories concerning the mechanism of oxidation of unsaturated polymers are reviewed, and the infrared absorption spectra data are interpreted in terms of these theories. A possible mechanism of antioxidant action is suggested.

VARIATION OF COMPOSITION OF 40:60 ISOPRENE-STYRENE COPOLYMERS WITH CONVERSION. E. Dyer and D. L. Munroe. J. Am. Chem. Soc. *68*, 2726 (Dec. 1946). In ascertaining the effect of varying conditions on the emulsion copolymerization of a 40:60 mixture of isoprene and styrene, an approximately equimolecular mixture, it was observed that the initially formed copolymer contained about 80 percent of styrene. As the reaction was continued to maximum conversion, the styrene content decreased to approximately 60 percent. These results show that at this monomer ratio, styrene enters the copolymer faster than does isoprene. This behavior is similar to that of styrene when copolymerized with acrylonitrile and with vinylidene chloride. The evidence also indicates that the copolymer is not homogeneous with respect to composition.

EMULSION POLYMERIZATION OF DIENE HYDROCARBONS. H. W. Starkweather, P. O. Bare, A. S. Carter, F. B. Hill, Jr., V. R. Hurka, C. J. Mighton, P. A. Sanders, H. W. Walker and M. A. Youker. Ind. Eng. Chem. *39*, 210–22 (Feb. 1947). The results of an exploratory study of the emulsion polymerization of conjugated diene hydrocarbons to yield rubberlike polymers are summarized. Such polymerization variables are discussed as purity of reagents, nature and amount of a second monomer, emulsifying agents, alkali concentration, catalysts, catalyst activators, modifying agents, temperature and yield. An investigation of the influence of some 214 different compounds copolymerized with butadiene reveals wide differences in the polymerization rate and properties of the copolymers, depending upon the structure of the second monomer. Such vinyl compounds as methacrylic acid esters, methyl vinyl ketone, dimethyl vinyl ethynyl carbinol give with butadiene potentially useful copolymers. Convenient forms of equipment for the small-scale preparation, compounding and testing of new types of elastomers are described.

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EXTRUSION. J. Bokeeno (to Radio Corp. of America). U. S. 2,411,847, Dec. 3. An oxidizable thermoplastic material is extruded from a receptacle (having an open top and an orifice adjacent to its bottom) by placing the material in a solid state into the receptacle, forming a non-miscible liquid layer on the otherwise exposed top surface of the material to prevent oxidation of the surface when exposed to atmospheric pressure at its molding temperature.

COMPOSITE FILM. A. Hershberger (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,411,878, Dec. 3. A method for laminating non-vulcanizable non-fibrous synthetic film material with butadiene copolymer comprising forming on the surface of at least one of the materials an adhesive composition consisting of a polyvinyl butyral and a polyhydric phenol-aldehyde resin, then bonding surfaces under heat and pressure.

ACRYLIC ESTER POLYMERS. S. T. Semegen (to B. F. Goodrich Co.). U. S. 2,411,899, Dec. 3. A plastic polymer of an acrylic acid ester is cured by heating with 2 to 25 percent of an alkali metal salt of silica dispersed therein.

ROSIN MODIFIED RESIN. G. Spiller (to Hercules Powder Co.). U. S. 2,411,904, Dec. 3. A resinous reaction product of a partially reacted α,β-unsaturated dicarboxylic acid-dihydric alcohol ester and a monohydric alcohol ester of unsaturated rosin.

POLYMERS. W. J. Burke (to E. I du Pont de Nemours & Co., Inc.). U. S. 2,411,954, Dec. 3. The polymeric addition product of a monomeric hydrocarbon polythiol and a polymeric polyunsaturated ester of a polyhydric alcohol with an unsaturated acid.

IDENTIFICATION BUTTON. F. D'Antonio. U. S. 2,411,987, Dec. 3. An identification button containing a disk-like body of plastic material.

SYNTHETIC RESINS. G. F. D'Alelio (to General Electric Co.). U. S. 2,412,034, Dec. 3. A molecularly oriented fiber showing a characteristic X-ray diffraction pattern comprising a cold-drawn copolymer of acrylonitrile, ethyl acrylate and ethyl methacrylate.

NYLON FILAMENTS. W. R. McClellan (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,412,054, Dec. 3. Improved filaments of synthetic linear polyamide containing a permanent fusible phenol-formaldehyde resin are prepared by treating said filaments in the molecularly oriented state while held at fixed length with water at a temperature above 85° C., subjecting to the action of hot aqueous alkali solution and continuing the treatment until at least 1 percent but not over 20 percent of resin is extracted.

SHEET MATERIAL. F. E. Wiley, R. W. Canfield, R. S. Jesionowski and J. Bailey (to Plax Corp.). U. S. 2,412,187, Dec. 3. Apparatus for forming continuous biaxially oriented sheet of solvent-free organic polymer.

HECTOGRAPH PAD. R. D. Blum, Jr. U. S. 2,412,200, Dec. 10. A duplicating pad for a hectograph comprising polyvinyl alcohol, glycerol, antimony trifluoride, titanium dioxide, ethylene glycol and calcium chloride.

RUBBERLIKE COMPOSITION. M. T. Harvey (to Harvel Research Corp.). U. S. 2,412,216, Dec. 10. A rubberlike composition capable of vulcanization with sulfur comprising a blended mixture of a butadiene synthetic rubber, a polyvinyl ester such as polyvinyl chloride or polyvinyl acetate or copolymers thereof, and a mutual solvent comprising a reaction product of formaldehyde and turpentine under acid conditions.

MOLDED PLYWOOD. G. E. Kloote (to Haskelite Manufacturing Corp.). U. S. 2,412,274, Dec. 10. An apparatus for molding laminated panels having side portions joined by a curved edge-forming bend comprising a rigid male die, an outer face conforming to the internal contour of the sides, a removable elastic blanket, means for sealing the edges of the blanket to the die and adapted to being subjected to fluid pressure, flexible means adapted for tensioning over the bend for compacting the plies at the bend independently of the fluid pressure.

PROTEIN PLASTICS. G. E. Eilerman (to Pittsburgh Plate Glass Co.). U. S. 2,412,327, Dec. 10. A relatively moisture-resisting composition comprising casein and a compatible amide of a sulfonic acid containing a single benzene nucleus and an aliphatic hydroxy amine.

MOLDING. A. B. McGinnis (to Wheeling Stamping Co.). U. S. 2,412,411, Dec. 10. A molding press attachment.

STRIP MATERIAL. E. L. Slingluff and D. R. Scheu (to B. F. Goodrich Co.). U. S. 2,412,429, Dec. 10. A method of striping a thermoplastic flexible strip material comprising extruding a continuous strip through a heated die, advancing the still heated strip adjacent to a nozzle, flowing from said nozzle a striping liquid comprising a fusible binder capable of adhering to the strip, drying and applying additional heat to fuse the stripe onto the strip.

BOAT HULLS. L. P. Hall, Jr. U. S. 2,412,455, Dec. 10. The method of fabricating a boat hull out of flexible sheet material comprising cutting the planking sections to the exact shape required to produce the hull, bringing the cooperating edges together, temporarily securing said sections to one another by means of adhesive tapes, permanently securing the sections by filling and bridging the joints between sections with fillets of adhesive material, and removing the tape after the adhesive material has hardened.

ACRYLIC ESTER POLYMERS. S. T. Semegen (to B. F. Goodrich Co.). U. S. 2,412,475–6, Dec. 10. Plastic polymers of acrylic acid esters are cured by heating with an alkali metal salt of stannic acid or vanadic acid.

PIPE FLANGE. O. B. Amley and J. B. Gregory (to Dow Chemical Co.). U. S. 2,412,487, Dec. 10. A thermoplastic pipe flange.

POLYMERIZATION. G. Goldfinger (to Godfrey L. Cabot, Inc.). U. S. 2,412,504, Dec. 10. Monomeric materials such as styrene and butadiene are pretreated prior to polymerization by heating the monomer containing an inhibitor such as hydroquinone to the boiling point in contact with carbon black, causing initial polymerization, and absorbing the inhibitor and prepolymer.

CONTAINER COATING. J. C. Morrell. U. S. 2,412,528, Dec. 10. A container comprising a body, the interior of which is coated with a flexible prime coating comprising a polymerized hydrocarbon and a rigid top coating of synthetic thermoplastic resin.

COMPOSITE BOARD. B. M. Randall (to Tek Wood, Inc.). U. S. 2,412,534, Dec. 10. An impregnated composite board is prepared by providing a compressible resin-impregnated carrier sheet, assembling in dry state between two wood veneer sheets, subjecting to a pressure of at least 1500 p.s.i. in the presence of heat, thereby compressing the sheet to less

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than half its original thickness accompanied by fusing the resin and forcing it into the veneer, and maintaining pressure until the resin has become set.

CONDENSATE. E. Lieber (to Standard Oil Development Co.). U. S. 2,412,589, Dec. 17. A resinified material derived by resinifying an aromatic hydrocarbon with an aldehyde is alkylated with an alkylating agent containing less than seven carbon atoms at a temperature above 125° F with a Friedel-Crafts catalyst, hydrolyzing and removing the catalyst and distilling the reaction product under reduced pressure to 600° F to obtain the desired product as distillation residue.

CHEWING GUM BASE. B. N. Lougovoy. U. S. 2,412,590, Dec. 17. An elastomer adapted for a chewing gum base consisting of methacrylic acid ester polymer having in the ester radical three or more carbon atoms, ester of abietic acid.

FACING MATERIAL. C. E. Maier (to Continental Can Co.). U. S. 2,412,592, Dec. 17. A paper liner facing material comprising a paper base and a coating thereon comprising a layer of oleoresinous varnish sealing the paper and providing a continuous outward surface, a continuous top coating film having an unplasticized resinous base consisting of polymerized vinyl halide, vinylidene halide, or other vinyl resin or copolymer resin and a resin such as maleic anhydride glycerol esters of rosin, the tripolymer resin of vinyl halide, vinyl acetate and maleic anhydride, said material being characterized by being flexible, having a tough, impermeable, exposed surface and being unitary.

ABRASIVE. H. W. Buell (to Carborundum Co.). U. S. 2,412,599, Dec. 17. A coated article containing a film comprising the heat-hardened reaction product of a mixture comprising cutocellulosic flour and a water-soluble reaction product of urea and formaldehyde.

MOLDING COMPOSITIONS. W. E. Gloor (to Hercules Powder Co.). U. S. 2,412,611, Dec. 17. A molding powder consisting of granules of colloided thermoplastic composition comprising cellulose acetate and a plasticizer therefore.

MAGNETIC BODY. A. F. Bandur (to Western Electric Co., Inc.). U. S. 2,412,668, Dec. 17. A magnetic body comprising particles of magnetic material insulated from one another and bonded by the end products of a heat-treated composition comprising a water-soluble soap of glycerol-phthalate resin and casein.

TAPE. G. G. Pierson. U. S. 2,412,693, Dec. 17. Veneer strips are joined to a base by adhesives using a tape impregnated with a cold-setting adhesive which becomes sticky when moist, moistening the tape adhesive, and while moist, gluing the tape to surfaces of abutting veneer strips, and gluing the composite sheet of veneers thus formed to the base under pressure with the tape within the glue line by a laminating adhesive containing moisture whereby the moisture of the laminating adhesive is free to penetrate to and remoisten tape adhesive while under laminating pressure.

COATING. G. P. Waugh and W. O. Kenyon (to Eastman Kodak Co.). U. S. 2,412,699, Dec. 17. A composition adapted to form permanent water-wettable surfaces on surfaces such as vinyl polymers, comprising ethyl lactate, methyl Cellosolve acetate, cellulose acetate and alcohol.

TAPE. R. W. Wieseman (to General Electric Co.). U. S. 2,412,851, Dec. 17. A dynamoelectric machine coil having an electrically conductive interior, a non-adhesive insulating tape around the interior, and means including a polyvinyl formal resinous tape arranged around the non-adhesive tape.

ION ADSORPTION. R. W. Auten and D. S. Herr (to Resinous Products and Chemical Co.). U. S. 2,412,855, Dec. 17. Ion exchange resins comprising the condensation product of an aldehyde such as formaldehyde, acetaldehyde, butyraldehyde, benzaldehyde, or furfuraldehyde in the presence of a water-soluble salt of sulfurous acid and a metal of group IA of the periodic table with a member of the group consisting of melamine, melam, ammeline, thioammeline, methyl ammeline ethyl ammeline, β,β'-bis-thioammeline diethyl ether, 2,6-diamino-1,3-diazine, 5-methyl-2,6-diamino-1,3-diazine and 4-chloro-2,6-diamino-1,3-diazine.

CELLULOSE DERIVATIVE. F. J. Soday (to United Gas Improvement Co.). U. S. 2,412,920, Dec. 17. A cellulosic derivative such as cellulose ethers and esters plasticized with a pitch-free hydrocarbon oil.

DRY CASTING. G. W. Brant (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,412,947, Dec. 24. A dry casting solution consisting of acetone-soluble cellulose acetate, dibutyl phthalate, ethyl cellulose and acetone.

TETRAFLUOROETHYLENE COPOLYMERS. K. L. Berry (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,412,960, Dec. 24. A solution in organic solvent of a copolymer of tetrafluoroethylene and ethylene containing 50 to 85 percent tetrafluoroethylene, said solvent being a neutral ester of a saturated dicarboxylic acid.

POLYMERS. A. W. Larchar (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,412,993, Dec. 24. A process for preparing N-alkoxymethyl polyamides comprising heating formaldehyde and an aliphatic alcohol with a solution in monobasic carboxylic acid of a linear carbonamide which has hydrogen-bearing amide groups as an integral part of the polymer chain and in which the average number of carbon atoms separating such groups is at least two and then precipitating the N-alkoxymethyl polyamide with an ester composed of the same acid radical as comprises the solvent and same alcohol with which polyamide solution was reacted.

MOLDING COMPOSITIONS. W. S. Traylor and D. R. Wiggam (to Hercules Powder Co.). U. S. 2,413,011, Dec. 24. A thermoplastic casting composition capable of being melted and poured into molds to form such objects as tools, dies and jigs, comprising ethyl cellulose, a plasticizer, a compatible thermoplastic resin and a wax.

PLASTIC GRATER. A. A. NuDell. U. S. 2,413,151, Dec. 24. A 1-piece grater formed of plastic material.

POLYVINYL ACETATE DISPERSIONS. J. E. Smith and W. A. Drummond (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,413,197, Dec. 24. A disperse aqueous system comprising in uniform distribution a vinyl acetate polymer, a polymerization catalyst, a stabilizer comprising a petroleum hydrocarbon, a wetting agent comprising a sulfated aliphatic alcohol and a surface-active agent.

BRUSH BACKS. G. F. D'Alelio (to Pro-phy-lac-tic Brush Co.). U. S. 2,413,219, Dec. 24. In a brush having the bristles stapled in drilled holes in the bristle block, said bristle block being formed of polystyrene, wood flour, a plasticizer and pigment.

PLASTIC COMPOSITION. G. J. Manson (to Shawinigan Chemicals Ltd.). U. S. 2,413,239, Dec. 24. A composition comprising an intimate mixture of polyvinyl ester resin; a wax such as paraffin, candelilla, beeswax or carnauba; an elastomer such as Hevea or an isoprene isobutylene copolymer; a non-toxic plasticizer; a non-toxic oil softener; and a filler.

POLYSTYRENE. F. J. Soday (to United Gas Improvement Co.). U. S. 2,413,258, Dec. 24. A plastic composition comprising a polymer of styrene or alkyl styrene and a plasticizing agent consisting of a high boiling fatty alkyl ester.

POLYACRYLIC RESINS. F. J. Soday (to United Gas Improvement Co.). U. S. 2,413,259, Dec. 24. A polyacrylic or polymethacrylic resin is plasticized with a pitch-free aromatic hydrocarbon oil boiling above 210° C.

POLYVINYL ACETAL MALEATES. F. E. Wilson, G. J. Esselen and G. F. D'Alelio (to Pro-phy-lac-tic Brush Co.). U. S. 2,413,275, Dec. 24. In the acetalizing of a polyvinyl compound containing hydroxyl groups, the acetalization is conducted in presence of single catalyst such as maleic acid or maleic anhydride acting simultaneously as esterifying agent.

THIS SERVICE

CUSTOM FITS PLASTICS TO YOUR NEEDS

■ We are prepared to work with your organization through all phases of a molded plastics application—from preliminary discussion and research to design development, molding and finished assembly.

■ Our objective is to help you find the most practical plastics application for your products; to determine *how* and *where* plastics should be used.

■ We recommend the plastic material best suited to your requirements—to add strength, attractiveness, insulating properties, comfort-in-use, color appeal or other desired qualities.

■ Our equipment is the most modern type for injection, transfer and compression molding. We are experienced in precision molding to extremely close tolerances, and have facilities for high speed, volume production.

■ One of our specialties is molding plastics in combination with complementary metals.

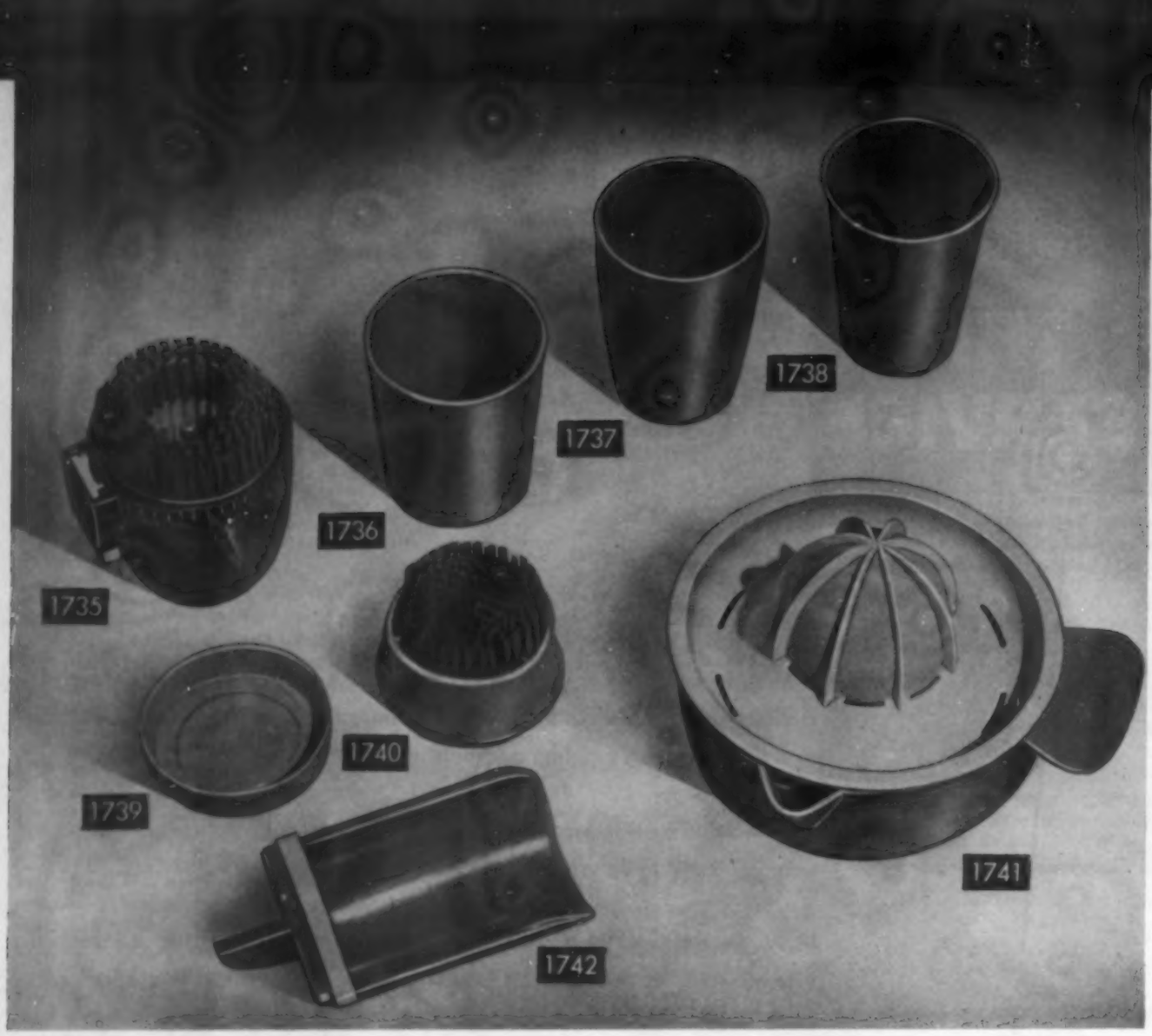
■ Working closely with engineering departments of plastics users, we have developed new molding techniques and unusual plastics applications. Let us discuss your products and how they may benefit further from plastics.

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CAMBRIDGE, OHIO—633 Upland Road • LOS ANGELES, CAL.—1440 S. Robertson Blvd.
CANADA—David C. Orrock & Co., 1405 Bishop St., Montreal



Plastics Stock Molds*

SHEET ONE HUNDRED FORTY-EIGHT

These colorful plastic articles will add to the convenience and attractiveness of kitchen and bathroom. Match dispensers are unique and handy, a boon to every housewife. The fruit juicer acts as a strainer as well. Measuring scoop is used for everything from shortening to sugar. The variety of tumblers will meet every purpose.

1735. Wall pullmatch dispenser, holds 250 matches which are refillable. Cavity in top for burned match splints. Slip bracket permits removal of dispenser from wall. Overall height is 3 1/2 in.; 3 1/4 in. in diameter. Dispenser available in red, blue, ivory; matches in red, blue, yellow.

1736. Tumbler to fit recessed bathroom fixtures. Eight-ounce capacity. Height is 3 1/8 in.; top diameter, 2 3/4 in. tapering to 2 1/4 in. at bottom. Available in red, blue, ivory, green.

1737. Thermosetting tumbler, 3 3/4 in. in height. Top diameter is 2 1/2 in. tapering to 1 7/8 in. at bottom.

1738. Flexible tumbler, 3 1/2 in. high. Top diameter is 2 3/4 in. tapering to 1 3/4 in. at bottom. In green, blue, orchid, white, yellow, orange.

1739. Thermosetting coaster 2 3/4 in. in diameter. Height is 5/8 inch.

1740. Ring pullmatch dispenser, holds 250 matches which are refillable. Height 1 3/4 in.; diameter, 2 3/4 inches. Dispenser in red, blue, green, ivory; matches in red, blue, yellow.

1741. Two-piece fruit juicer with bowl of 20-oz. capacity. Separates juice from seeds and pulp. Overall height is 4 in.; 5 3/4 in. in diameter. Reamer available in ivory; bowl in red, green, blue.

1742. Scoop for bulk food cannisters has measuring partition. The overall length is 5 3/8 in.; 2 1/2 in. wide. Full capacity is 1/2 cup. Available in red, blue, ivory, green.

The names and addresses of the manufacturers who make these stock molds are listed on page 225.

* Reg. U. S. Patent Office.

when the cold's on... count on

Lustron
A MONSANTO PLASTIC

1. Tensile and impact strength that *increases* at lower temperatures
2. Resistance to chemicals and moisture
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This unique combination of excellent physical, chemical and electrical properties, plus unsurpassed appearance, makes Lustron, Monsanto's versatile polystyrene, adaptable to thousands of widely varied applications.

It will pay you to investigate these efficient, sales-making Lustron advantages for your products. Write, wire, phone: MONSANTO CHEMICAL COMPANY, Plastics Division, Springfield 2, Massachusetts. In Canada, Monsanto (Canada) Ltd., Montreal, Toronto, Vancouver.

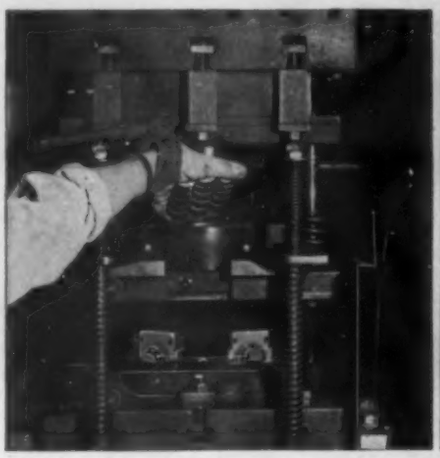
Lustron: Reg. U. S. Pat. Off.

Stromberg-Carlson produces

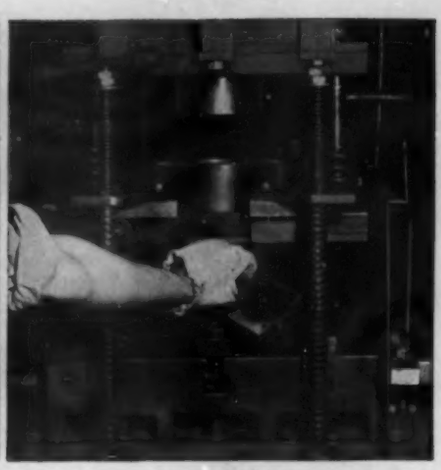


200-ton Lake Erie Hydraulic Press producing telephone handset handles in the Stromberg-Carlson plant in Rochester, New York. Many of America's best-known plastic products are molded on Lake Erie Hydraulic Presses.

Precision Moldings with LAKE ERIE Hydraulic Press



1 Electronically pre-heated pellets of Durez phenolic plastics are inserted in the mold. The handset handle fixture is pre-heated with infra-red lamps.



2 Removing the molded handset handle and fixture from the Lake Erie Press. The handle is molded at 250°F. under a pressure of 80 to 85 tons.

Every detail of design and production of Stromberg-Carlson telephones is performed under rigid quality controls. Just as Stromberg-Carlson is proud of the handsome, compact, lightweight and durable telephones it produces, so too is Lake Erie proud of the fact that its equipment is used in the manufacture of these quality products...that its equipment meets the high production standards established by Stromberg-Carlson.

Presses produced by the Lake Erie Engineering Corporation are used extensively by leading molders...are available in a wide range of types and sizes including compression, duplex, multiple-unit, laboratory and test models. Next time you are contemplating the purchase of a press, be sure to get all the facts about Lake Erie presses. In the meantime, for reference purposes and your convenience, why not write for Bulletin 544 illustrating and describing the many types and sizes of standard presses now available.



3 While the handset handle is still hot, threaded brass inserts are installed. Cooling shrinks the handset handle tightly around the inserts.



4 Buffing and polishing give the handset handle a smooth, gleaming finish. The earcap, transmitter and waterproof cord are then installed.



5 Final assembly of the Stromberg-Carlson telephone...a product noted for its uniformity, beauty and durability.

● Leading manufacturer of hydraulic presses—all sizes and types—plastic molding... metal working... forging ...metal extrusion ...processing...rubber vulcanizing... stereotyping... special purpose.

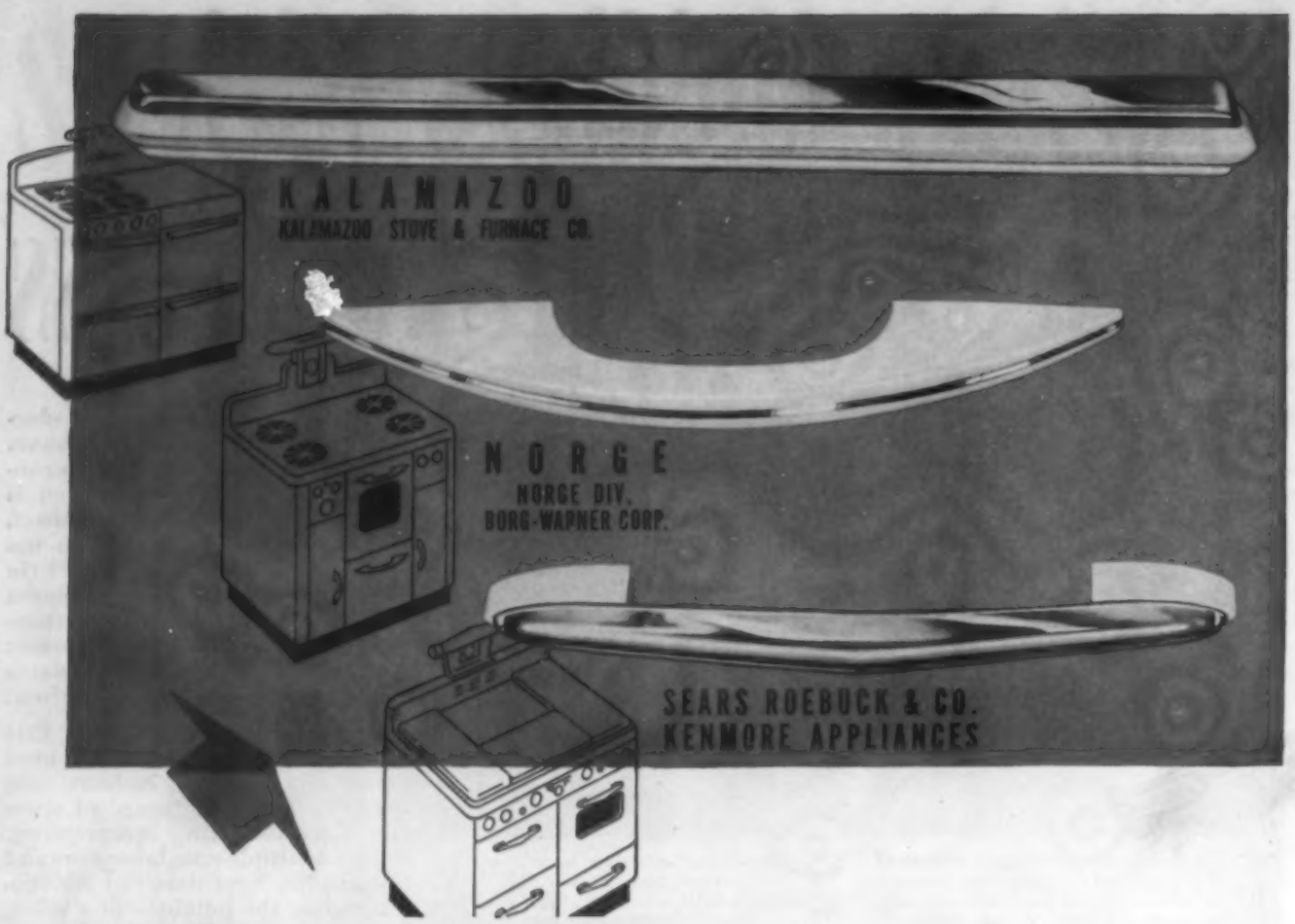
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The handles illustrated are made exclusively for the manufacturers as indicated. However, we do have a complete stock line of handles, or we will make special handles to your specifications.

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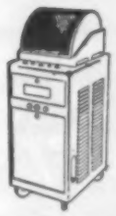
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DUAL PREHEATERS



5 KW
Model EK



COMPACTNESS

Never before has so much preheating power and utility been packed into so little space as in the new series of AIRTRONICS Dual Preheaters. For example, the 5 kw Model EK, with all the AIRTRONICS production-speeding features of control and operation, measures only 22" x 26" x 41"—small enough to locate easily wherever it may be needed.



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All AIRTRONICS Preheaters have been designed for maximum simplicity of operation. Power output and preheating time are *automatically* controlled. To operate, the molder simply places the charge between the sturdy self-positioning electrodes, closes the hood and presses the proper "start" button.



EASY ADJUSTMENT

Dual power and time controls are mounted on a pivoting panel recessed in the cabinet front. Tilted out, the panel is fully accessible for set-up adjustments. Tilted in and locked, the set-up controls are *completely out of the way*, preventing unauthorized changes.



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AIRTRONICS Dual Load Selection, Automatic Power Regulation and Wide Range Load Accommodation make possible efficient handling of a greater variety of preheating jobs than ever before. In particular, the dual set-up controls permit running two entirely different loads, alternately, or in any sequence.

AIRTRONICS Dual Preheaters bring you compact, mobile preheating POWER, plus unequalled simplicity of application, adjustment and operation. Many other unique AIRTRONICS features, such as Automatic Excitation Regulation and powerful Vacuum Cooling of the high-frequency components assure trouble-free performance under the most rigorous operating schedules.

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* REG. U. S. PAT. OFF

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From the beginning of your idea to the finished product—Mottletone facilitates your every step toward profit. It's the all purpose plastic—durable, colorful, adaptable to an endless variety of products.

Mottletone is an acrylic that is *mottled through and through.* In addition, it possesses the color characteristics of cast phenolics, machines easily, has marbleized appearance, and retains its glistening, lustrous polish.

Whether you are already manufacturing a product or contemplating a new one, the use of Mottletone means greater sales for you in these ways: 1—Its striking colors attract customers. 2—Its rich onyx-like finish has the expensive appearance that sells. 3—Its durability provides the satisfying wearing quality that puts your product in demand again and again.

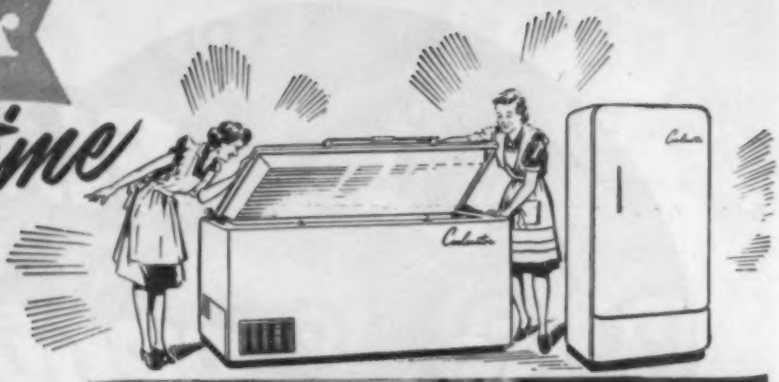
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Plasti - chrome, inc.

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Coolerator saves costly time training New Assembly Workers by using PHILLIPS SCREWS



Highlights from a comprehensive report by independent investigator of James O. Peck Co.—one of their studies of assembly savings made with Phillips Screws in leading plants...

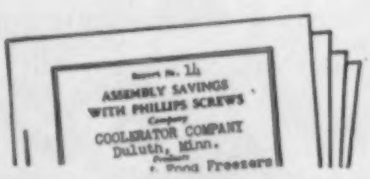
● "WE made an important saving we hadn't counted on when we switched to Phillips Recessed Head Screws," said the foreman of Coolerator's assembly line. "Instead of the expensively long period usually required to train operators to drive slotted screws, we found that new people could start driving Phillips Screws with a few simple instructions. Since we use about 125 Phillips Screws in every Coolerator and our daily production is 800, there isn't much time for teaching anyone how to drive a screw.

"EASIER TO USE, especially in awkward or blind applications... like fastening the black base to the bottom of the unit or attaching the ice container to the box. You have practically no control over slotted screws, while Phillips Screws are easy to line up.

"STOPPED PANEL DAMAGE and burring of heads. Assembly people used to almost write their names on the sides of the units when a slotted screw driver slipped. That cost real money... for disassembly, refinishing and reassembly, not to mention the disruption of the assembly line. Phillips Screws ended slips.

THE WHOLE STORY of this and other assembly studies in key plants... covering metal, wood and plastic products... will suggest similar savings to any production man. This coupon will bring you these reports—FREE. Mail it now.





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Send me reports on Assembly Savings with Phillips Screws.

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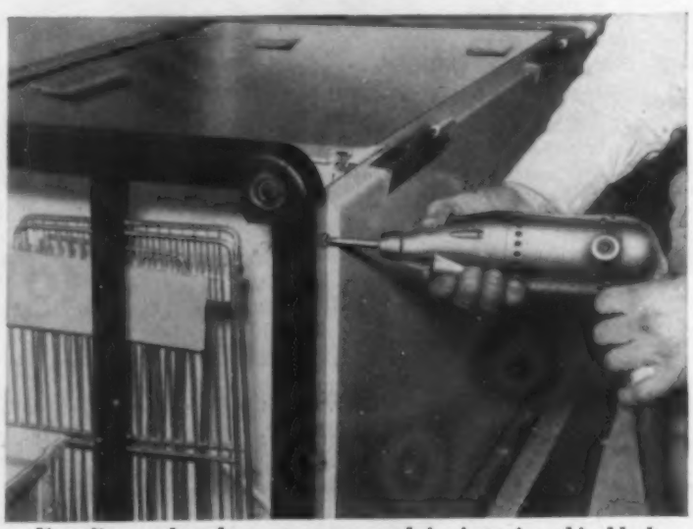
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MP-16



Here's a tricky bit of "blind" driving... through a small hole in the ice unit. With Phillips Screws, locating and driving is easier.



If ordinary slotted screws were used in fastening this black enameled base, inevitable driver slippage would do costly damage to the adjacent panels.

PHILLIPS *Recessed Head* SCREWS

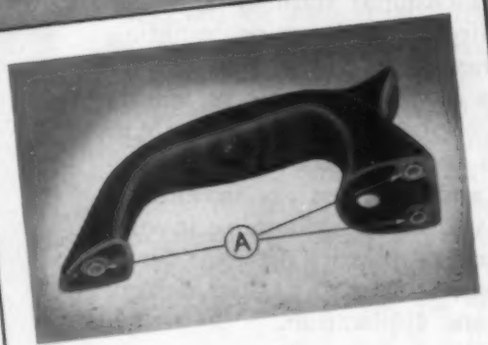
Wood Screws • Machine Screws • Self-tapping Screws • Stove Bolts

23 SOURCES

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MANY THINGS ARE BETTER BECAUSE OF PLASTICS





MOLDING MATERIAL
An economical general purpose phenolic material can be used because proper engineering has provided adequate insulation for the plastic parts. This material has ample strength and a fine finish that is pleasing to the touch.

MOLDING METHOD
The handle is molded in a 4 cavity semi-automatic top ram transfer mold. This method . . . combined with preforming and electronic preheating . . . provides a short molding cycle for a part with heavy cross sections. Electronic preheating, in addition to speeding the molding cycle, assures thorough curing of the part, despite a thickness variation of from 3/32" to 1". The knob is made in a 12 cavity semi-automatic compression mold.

MOLD DESIGN
The mold for the handle makes it possible to accurately place three inserts for facilitating assembly of the handle with the iron. The knob is molded with an insert to engage the splined shaft of the thermostat. A set screw hole is near the top of the insert. Graduations and lettering are molded in and later filled with white paint for permanent legibility.

The ability of plastics to fulfill structural needs . . . to provide pleasing lines and smooth, glossy surfaces has been accepted by the most discriminating manufacturers. The new Middleton electric iron is but one instance where increased sales appeal and reduced construction costs were provided by the intelligent use of AICO molded plastic parts.

Take full advantage of plastics. Let AICO engineers apply them to your product. Backed by more than 30 years of precision molding experience, AICO is qualified to recommend the most practical combination of molding method and material. The best answer to your needs is AICO's sole objective.

This is number 32 of AICO's series of plastics applications. A request on your letterhead will bring you the set, complete to date, on convenient file cards.

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GOOD TIMES IN PLASTICS



Clock hands always point to the time. Dow-Gunther Corporation thought up the attractive idea of having them point to something else, too — like snapshots, nursery pictures, etc. This manufacturer was smart in another way, too. They turned to the Shaw Insulator Company and had Shaw mold their idea into smart, handsome reality.

Shaw molded the unique clock frame out of ethyl cellulose, selecting the material because of its attractive colors, dimensional stability and machine-ability. The injection molding process was used.

Here is another example of Shaw's ability to apply plastics intelligently to new ideas and new products. Shaw experience and alertness are invaluable assets to you on any planning involving the use of plastics. Consult Shaw first when it comes to plastics design, molding and application.

SHAW

SHAW INSULATOR COMPANY

MOLDERS SINCE 1892

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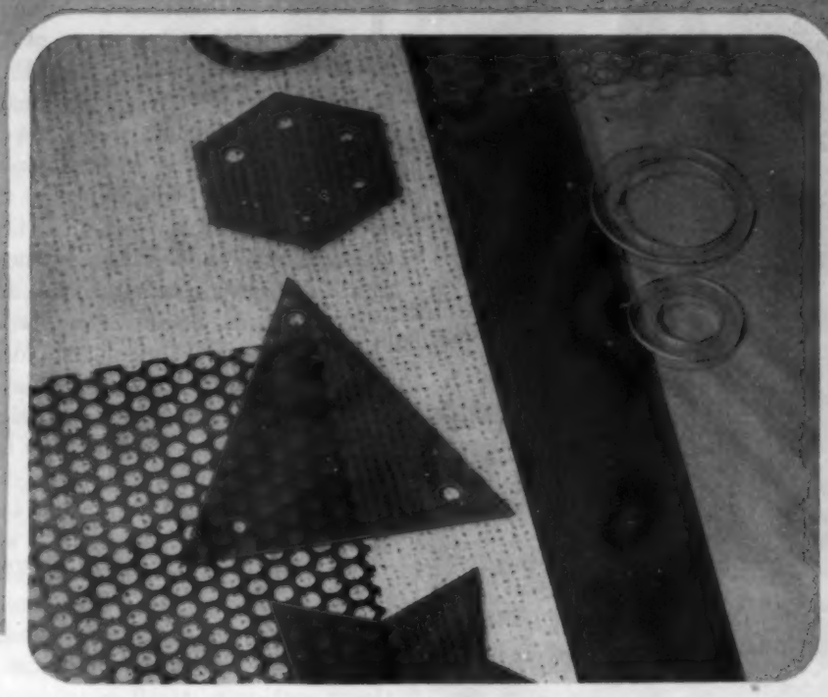
PLASTICS LITERATURE AVAILABLE

Shaw engineers have prepared a variety of literature, study of which might help you to a decision. Simply write a note about what phases of plastics especially interest you.

Or, you may prefer at once to call in a Shaw engineer, and present your problems for his study. This company's fifty-five years of plastics experience gives him a rich background from which you can draw.

Between the resources of Shaw and the Plax Corporation, Hartford 5, Conn., you can obtain assistance in almost all plastics methods and materials.

PLAX POLYFLEX LAMINATED FOR GREATER STRENGTH



Plax Polyflex*, thin polystyrene sheet oriented in two directions, provides industry with a plastic material that combines toughness and flexibility with outstanding electrical and physical characteristics. Now this remarkable plastic sheet is also available in laminated form — its strength increased manifold.

In this relatively new form, it is admirably suited for all applications where high dielectric and physical strength and chemical resistance are required. Plax laminated Polyflex sheet also has the attractive appearance that makes regular Polyflex sheet an ideal transparent box material. It comes in waterclear, natural polystyrene color, but can be made available in all colors through black. Write to Plax for additional details on this new material.

*T.M. Reg. U.S. Pat. Off.

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How to Cement Plax Polystyrene Products.
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Notes on Design and Assembly of Plax Polystyrene Products.
Die-cut Parts from Plax Polystyrene.
How to Form Plax Polystyrene Rod.

AND THIS PRODUCT INFORMATION

Data Sheets on Plax Cellulose Acetate, Cellulose Acetate Butyrate, Methacrylate, Polyethylene, Polystyrene and Ethyl Cellulose Products.
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Annual Canadian

THE annual conferences of S.P.I. (Canada), Inc., have always had an international flavor due to heavy attendance by executives of the plastics industry from the United States. The Fifth Conference, held February 19 and 20 at the General Brock Hotel in Niagara Falls, Canada, under the general chairmanship of Irving Wintrob, M. Wintrob and Sons Ltd., Toronto, maintained this tradition. The two-day conferences covered a wide variety of important topics, made provision for section meetings, a general meeting and election. Officers elected for 1947 are: president, J. H. McCready, Hale Brothers Ltd., Montreal; vice-president, I. D. Wintrob, M. Wintrob & Sons Ltd., Toronto; treasurer, Howard Yates, Crystal Glass & Plastics Ltd., Toronto; executive secretary, C. V. Hodder, Hodder & Moffitt, Toronto. Conference attendance was approximately 200. B. Gunter of Mack Moulding Ltd., Waterloo, Que., was chairman of the opening session.

First paper was, "A New Thermosetting Resin" by S. E. Brous, sales development manager, B. F. Goodrich Chemical Co., Cleveland, Ohio. The speaker thoroughly covered the allyl ester anomaly in which a thermosetting material is produced by polymerization reaction. Catalysts, curing, coloring, molding and laminating of Kriston were discussed, and applications were analyzed as to functional suitability.

Gordon Brown, vice-president of Bakelite Corp., New York City, spoke on "Safeguarding the Future of the Plastics Industry," showing that this industry's unsatisfactory experiences have taught and can teach fundamental principles on which action may be based to safeguard the future. Mr. Brown presented a group of case histories in which improper design or an incomplete understanding of material properties and molding methods produced unsatisfactory products, yet established data so that the same mistakes might not be made again. He offered the following suggestions to the industry: a) use thorough and scientific tests; b) design for accuracy; c) it is what you learn after you know it all that counts; d) beware of the hazard in someone else's business; e) use ordinary business precautions.

The February 19 luncheon was addressed by Mayor R. Hauck of Niagara Falls, Canada, and Jean Charles Harvey, famous French Canadian editor who spoke on "The Essence of Democracy." Luncheon chairman was B. F. Henden, Canadian Industries Ltd., Montreal.

John Walter of John Walter & Sons Ltd. was chairman of the afternoon session on February 19. First address was on "Fabrication and Design of Plastics" by Henry F. Pearson, Pearson-Berlinghof, Inc., Langhorne, Pa. Mr. Pearson discussed artistic, engineering and fabrication aspects of acrylic materials from a standpoint of end use and practicality of application.

S.P.I. conference

"Mutual Understanding in World Trade" was the topic of an address by Alan F. Telfer, general manager and secretary, Canadian Exporters' Association, Toronto. Pointing out that 1947 will be the turning point for the charter for an International Trade Organization of the United Nations and is, therefore, a period of crisis, he showed the leadership position of Canada and the United States at this time. He stressed the importance of closer, freer and friendlier international economic relations in the face of tariff restrictions, quotas, state monopolies and export subsidies. Since plastics are new products to most of the world, this industry, he said, has a challenge to meet in diversification and wide distribution of products.

The annual dinner on February 19 was under the chairmanship of J. H. McCready, Hale Brothers Ltd., and was addressed by the Hon. L. E. Blackwell, Attorney-General of the Province of Ontario.

The morning session of February 20 was under the chairmanship of R. W. Jackson, Canadian General Tower, Ltd., Toronto. Walter T. Noble, manager, Plastics Div., Fabricon Products, Inc., Detroit, Mich., spoke on "The Possibility of Low-Pressure Laminates in the Automotive Field." Analyzing the characteristics of automotive products with high volume and high production methods involving the use of expensive tools, he showed that considerable change in approach would be necessary on the part of the low-pressure industry if its products are to succeed in automotive construction. The low-pressure industry, having an excellent war record but lacking the good experience of competition, must now learn how to produce in quantity at low cost. He referred to the Briggs Mfg. Co.'s interior panel for station wagons[1] as one of the outstanding applications of low-pressure laminates in the automotive field.

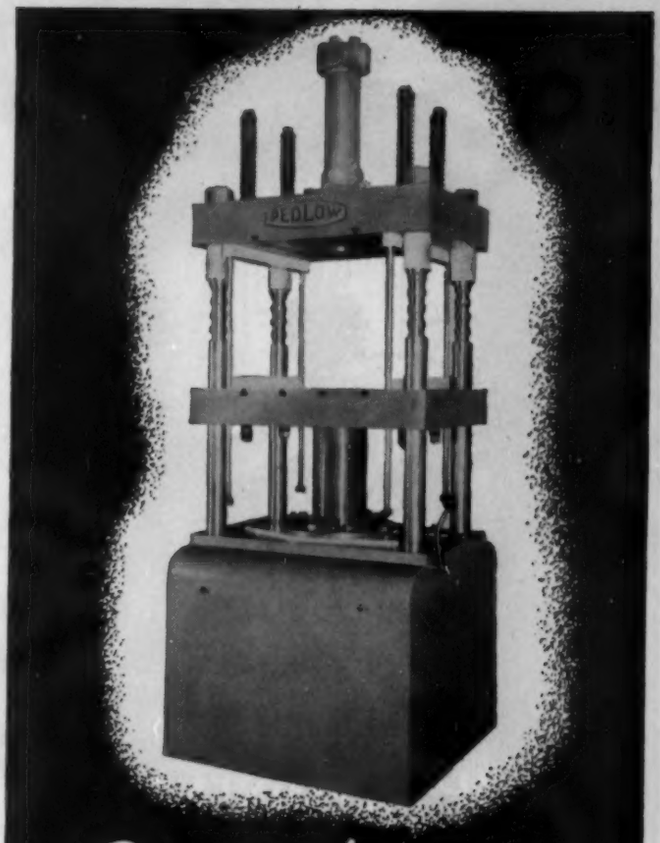
Professor J. E. Cameron, Queen's University, Kingston, Ont., spoke on "Recent Trends in Employer-Employee Relations."

N. O. Broderson, president of S.P.I., was chairman of the February 20 luncheon which was addressed by Dr. M. H. Bigelow on "German Plastics Technology."

W. C. Hawkins, Canadian Resins and Chemicals Ltd., Montreal, was chairman of the closing session on February 20 which was addressed by Hiram McCann, associate publisher, MODERN PLASTICS, on "Operation Opportunity—Merchandising Plastics." He said the buyers' stiffer attitude was "a hangover which industry is suffering after an economic binge." The cure for the hangover, he stated, is selling.

"Robots at Work," a motion picture, was shown by R. A. Hopkinson, sales engineer, Williams and Wilson Ltd., Toronto, Ontario.

[1] "Laminates take over interior paneling in postwar automobile," MODERN PLASTICS 24, 112–118 (Jan. 1947).



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You can depend upon Pedlow's modern standard hydraulic presses of 50 to 300-ton capacity—and *special machinery designed and built to your individual requirements*—for efficient, economical, trouble-free molding operations. For "on time" deliveries of rugged, accurate presses—such as we've made for Bakelite, Du Pont, Electric Auto-Lite, Tri-United Plastics and other leaders—you're wise to look to PEDLOW.

Press Illustrated—50-ton hydraulic for compression or plunger molding.

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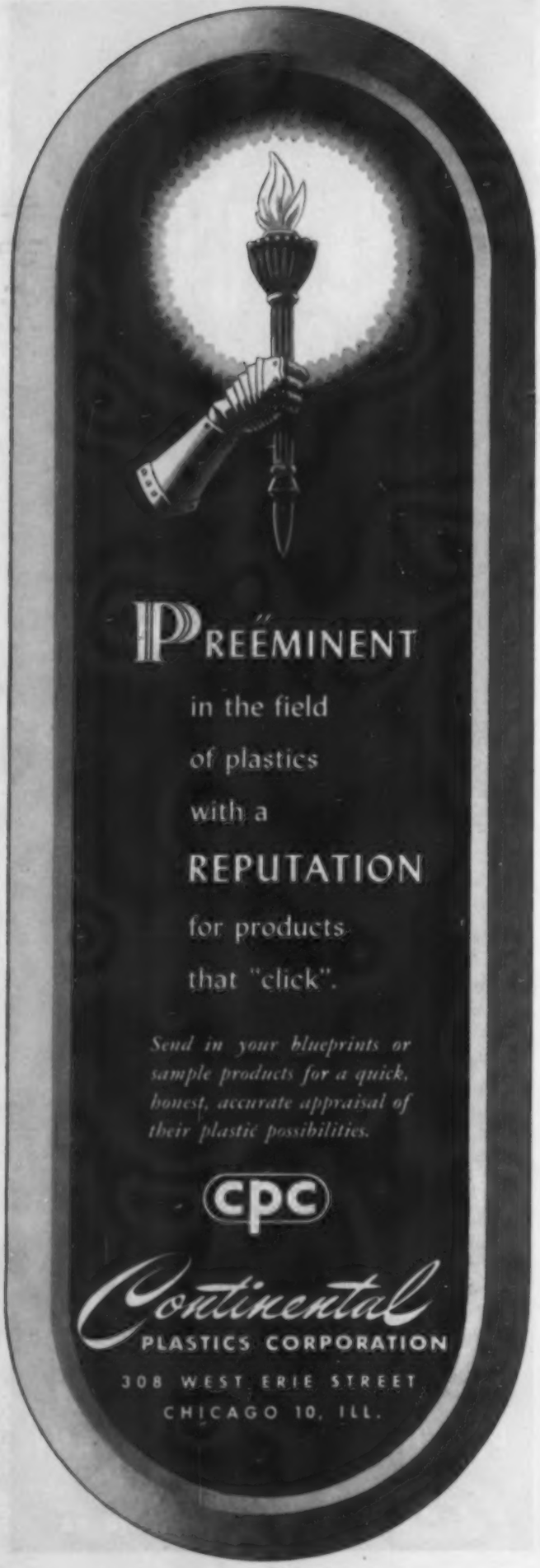
Note: Some territories open for reputable sales agents.

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Hydraulic & Special Machinery

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S.P.I. Chicago Convention

May 7–9

THE outlines of the program for the Second Annual Convention of the Society of the Plastics Industry, to be held at the Stevens Hotel, Chicago, on May 7 through May 9, have now been decided upon, according to W. K. Woodruff, chairman of the conference committee. The schedule, just announced, is as follows:

Wednesday (May 7): A forum discussion on "Plastics Must Be Sold," at which men prominent in the merchandising field will speak.

Thursday (May 8): Meetings of the Compression, Fabricating, Extrusion, and Film and Foil Div.
Annual meeting and election of officers for the coming year.
Annual banquet.

Friday (May 9): Meetings of the Injection, Machinery, Low Pressure, Tool and Die, and Accounting Divisions.

The Chicago conference committee is composed of W. K. Woodruff, Celanese Plastics Co., chairman; John J. Bachner, Chicago Molded Products Corp.; C. N. Sprankle, Sandee Mfg. Co.; Edward Singer, Victory Mfg. Co.; Charles F. Elmes, Elmes Engineering Works of American Steel Foundries; Ben Rau, G. Felsenthal & Sons; H. A. Raymond, Jr., Plaskon Div., Libbey-Owens Ford Glass Co.; Leonard Becker, S. Buchsbaum & Co.; Ralph Blanchard, Stimsonite Plastics Div., American Gas Accumulator Co.; Paul Tietz, Richardson Co.

Plastics Show

The Second National Plastics Exposition, to be held at the Coliseum in Chicago, May 6 through May 10, will be entirely a trade show. Industrial, commercial and press representation is expected to be heavy, but no bid will be made for public attendance. Admission will be by invitation cards which are being distributed to customers and prospective customers by the exhibitor companies.

More than 135 exhibitors already have been assigned space for the show. Breakdown of the exhibitors follows the line of the industry, with a heavy representation of molders, fabricators, materials manufacturers and machinery firms. Three main phases of the industry will be covered by the show: new products exhibits; recent machinery development for plastics production; and the latest fabricating techniques. Heavily underscored throughout the show will be the "almost 100 percent" plastics conversion to peacetime uses. The S.P.I. expects that one of the major revelations will be the technical advances which have been consolidated in all phases of industry in the past year.



"Relax, Reverend! Not a Cuss Word Out of Her Since We Got Her A Plastic Stand."

AND wouldn't you enjoy relaxing a little on some of your molded plastic needs by tossing the ball to us and letting us worry about what materials to use and how to design and mold the parts you want. If the job requires any cussing to get it right, let *us* do it.

And don't think we don't say a few ?!+/X words every so often over a job because we do. You see, we don't pretend to know all the answers and that sometimes calls for a lot of hard plugging to figure out all the angles to a job. We can and will say, though, that we have licked a lot of tough molding jobs; and you can't do that without learning something.

If you'd like some help, please phone or write our New York office.

If it can be Molded, Boonton can Mold it—We Hope

BMCO

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FOR OVER 25 YEARS
CUSTOM ENGINEERS
OF MOLDED PLASTICS

BOONTON MOLDING COMPANY

MOLDERS OF MOST PLASTICS BY MOST METHODS

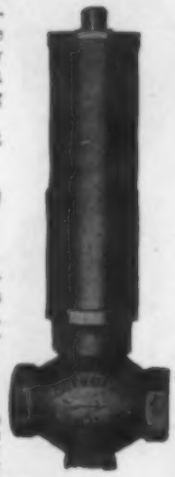
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End Your High Pressure Reducing Valve Problems.

We find that many plastics plant operators are "putting up" with high pressure reducing valve problems because they think there is no solution. They think the job is "too difficult" for any reducing valve to handle with ease.

If you are in that position we suggest that you try



ATLAS Type "E"

shown at the right. This remarkable reducing valve reduces pressures as high as 6,000 psi *without shock*—water, oil or air. As a result it is now lauded by many former "disbelievers".

What Makes It So Good?

It is so good because every detail is *right*. It is made by a concern that has specialized solely in regulating valves for nearly a half century. For example, the body of this ATLAS valve is entirely of forged steel. All internal metal parts are wholly of stainless steel. A formed packing of special material superior to leather is used which is immune to all fluids commonly used in hydraulic machinery. The pressure on the seat is balanced by a piston with the result that variations in high initial pressure have little effect on the reduced pressure. Ask for complete information.

For other ATLAS plastics plant products see the partial list in our ad in the January 1947 issue of MODERN PLASTICS

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REGULATING VALVES FOR EVERY SERVICE

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Representatives in Principal Cities

MODEL *IN PLASTIC*

BEFORE YOU MOLD

That's sound advice. A plastic pre-mold model will eliminate all guesswork. It's the only safe way to insure against errors and costly time-consuming mistakes.

Stricker Brunhuber will make an accurate, three-dimensional plastic model of any item you are developing. Whether your job is large or small, our experience and skill enables us to turn out work that meets every specification.

We also furnish

INJECTION and COMPRESSION MOLDS

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Reporting on the

THE proposed law H. R. 1111 (Arnold bill) to prevent the use of highly flammable materials in wearing apparel should be carefully amended before it can be practically applied. Such was the opinion expressed by representatives of the Society of the Plastics Industry who appeared before the members of the House Committee on Interstate and Foreign Commerce on March 4 and 5 in the interests of the plastic industry. Spokesmen for the plastics industry were Wm. Cruse, executive secretary of S.P.I., and Dr. Foster D. Snell of the Foster D. Snell Research Laboratories.

Testing methods in question

The plastics representatives endorsed the objective of preventing use of highly flammable materials in wearing apparel but asserted that much more extensive study and research are necessary to determine adequate testing procedures and to devise methods which will assure effective control. Until a definite testing method which gives uniform results under all conditions can be devised and approved by the various industries concerned and until flame retardant methods are proven satisfactory, the proposed law would create chaos and extreme hardship in the opinion of a majority of witnesses from the textile industry who appeared before the House Committee.

In support of the bill

The Arnold bill, H. R. 1111, is apparently sponsored by retail groups spearheaded by the National Retail Dry Goods Association, whose representatives defended all of its provisions before the Committee and attempted to show that their test method, as proposed under terms of the bill, could be successfully applied to any material, "woven, felted, or otherwise produced from or in combination with any natural or synthetic fiber, film or substitute thereof" which was interpreted by their spokesman to cover cotton, wool, rayon, synthetic fibers alone or in combination, coated fabrics and plastic films. They further insisted on the inclusion of a paragraph which would ban "highly inflammable articles of personal adornment" which was aimed directly at some types of plastics buttons and of which the N.R.D.G.A. said: "My associates will show you just how dangerous an innocent appearing button can be." The bill provides no specific procedure for testing the flammability of buttons so it is presumed that they would have to be tested in the textile testing machine which would be an awkward responsibility indeed for the operator running the testing machine in that:

"No article of wearing apparel or fabric shall be deemed so highly inflammable under the provisions of this Act as to be dangerous when worn by individuals

flammability hearing

if, when tested under the conditions and in the manner prescribed therefore in then effective commercial standards promulgated by the Secretary of Commerce, it is not set afire or, if set afire, burns without a flame or with a flame which does not flash or spread at a rate greater than that specified by the applicable commercial standard, or at a rate of not more than 5 linear inches thereof during each 6 sec. of burning, whichever is the more severe test." There are no present applicable commercial standards for these "articles of adornment" and it would be extremely difficult to find such an article that was 5 in. long for this testing.

The "commercial standards" mentioned above are industry measurements or tests promulgated by the Bureau of Standards on a voluntary basis with industry. To gain acceptance, a standard must be approved by at least 65 percent of the industry affected. According to a witness from the National Cotton Council the bill not only relies on a standard which has not yet been promulgated and on unforeseen future revisions but on an undefined part of industry—that is, who is going to apply the flame retardant and who will be responsible for the test—knitters, converters, finishers, garment makers or who?

Opinion of S.P.I.

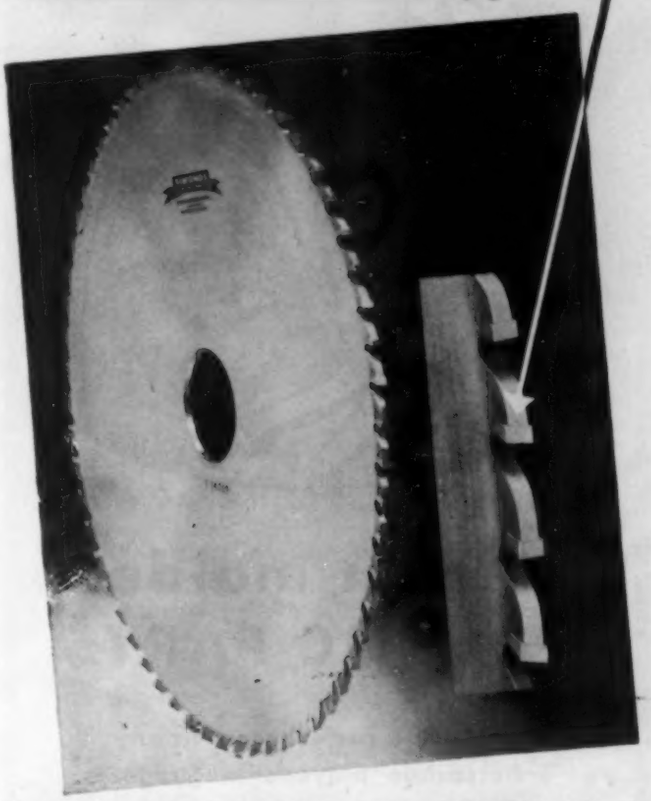
In presenting the opinion of the Society of the Plastic Industry committee on flammability, Dr. Foster D. Snell advocated:

That reference to buttons, bracelets, brooches, necklaces, pins and other articles of adornment be eliminated since those items are not to be considered hazardous because of their small size. Moreover they are difficult to ignite.

That the section which would require certain goods be marked "Flammable—Dangerous when Worn" should be eliminated because as presently drafted it is unworkable. The reference in the bill to "any fabric" would involve all fabrics of all types regardless of whether they are suitable for making of wearing apparel. For example, fabric of the type used for tobacco cloth might also be applied to some kinds of wearing apparel, but might not pass the proposed burning test. Therefore it would have to be marked with the word "Flammable" under the terms of this proposed Act.

In the definition of "fabric" in H. R. 1111, it could be construed to include such items as smooth paper, wax paper, mesh curtain fabrics, heavy draperies, floor coverings including carpetings, linoleum and a host of other unrelated materials. This is not thought to be the purpose of the bill which is primarily intended to regulate interstate shipment of flammable wearing apparel. Dr. Snell suggested that if this section is

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On all jobs except those requiring a fine-tooth saw, this Simonds Circular Saw is the top performer . . . especially where there is abrasive action or heat from the material being cut. With reasonable care not to chip the super-hard cutting tips, it can outlast any other saw, between sharpenings, on the same job. These tips are formed to shape with proper clearance on sides and top, and can be set differently for smooth sawing and for heavy cuts. Then for other jobs and conditions in plastic-cutting, Simonds also make Solid-Tooth Circular Saws of high-speed, semi-high-speed, and special alloy steels . . . as well as Band Saw Blades (including the new Skip-Tooth type) for cutting shapes and circles.



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THAT'S a perfect score in any horseshoe player's language. And it takes a perfect start and carry through to get the final results. So, if you have a new or an old product involving the use of custom molded plastics, *Start Right* - - See Franklin. Many products obtain maximum quality and sales appeal through the use of plastic parts.

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permitted to remain in the bill that the words "suitable for making wearing apparel" be inserted after the word fabric. He added that the term "consumer" of fabric also should be carefully pinned down so as to mean "every person who cuts, converts or otherwise alters such fabrics."

A further change suggested was that sales outlets be added to the manufacturing, converting and finishing processors required to submit to government inspections and keep records since the same records should be maintained by all persons affected.

Another amendment offered was that records and samples be preserved for a period of two years. This is in comparison to the indefinite time in the bill as it is now written.

Burning test

Most important change suggested by the plastics representatives was that specific mention of the burning test, which would label as highly inflammable any material which burned at a rate of more than 5 in. in 6 sec., be eliminated from the bill. This change was recommended because it was deemed that the proper place for the specifications of a test is in the commercial standard provided for as mentioned above in this article, and such specifications will necessarily be long and detailed. A commercial standard for textiles has been proposed but as the bill is written it would apply not only to textiles, but to plastic films, buttons, brooches, etc. The plastics industry feels that it should have its own commercial standards, according to an S.P.I. Committee which is now working on development of such a standard. Different materials behave in different manners and since two swatches of chenille cut from the same piece have been known to give different results when tested by the same machine, what is to be expected when a thin plastic film and chenille or even a tulle are also tested on similar apparatus?

Points of difference

The great points of difference of opinion brought out at the hearing concerned the practicability of present known flame-retardant methods and methods of testing. Chemical flame retardants for cotton fabrics are on the market, but according to processors who testified at the hearings, they wash out after a few launderings and frequently affect the hand or finish of the goods. The N.R.D.G.A. group insisted that chemical treatment could be successfully applied to prevent high flammability. It is known that some plastics are inherently flame retardant and even cellulose nitrate coated fabrics have been known to pass the 5 in. burning test with the specific textile testing machine that is implied, but not mentioned, in this bill.

Here are some of the things in a testing apparatus that can cause variation in the results: The wire carrying the current under the plate on which the cloth to be tested is placed may vary over a wide range of

sizes. Spaces between wires may vary from one design of machine to another. The plate may be set at a vertical, horizontal or slant with a far different burning rate in each case. The size (simulating a match) of the flame and its composition may vary. The flame from butane gas, for example, is much hotter than that from city gas or alcohol. Another question is whether the best test is obtained by igniting the cut edge or flat surface of the sample. The 6 in. length of the specimen mentioned in the bill does not say which five inches—a long strip could be hung from a ceiling and the rate of burning of the last instead of the first five inches might be measured. When the fabric has a long nap all samples would have to be combed in the same direction and the specs should say whether nap is to be up or down on the testing block. It is highly important according to technicians that the fabric be conditioned or heated to 125° F. or more before it is inserted in the test machine in order to account for such extraneous influences as humidity, and similar ventilating of each machine is an essential requirement. A striking difference noted in the two forms of apparatus displayed at the hearing was that one operated at a temperature of 60° C. inside the machine and the other at room temperature.

Testing method important

From the above remarks it can be seen that the importance of an explicit testing method is an essential requirement if a bill such as H. R. 1111 is to become law. The S.P.I. Committee is at work on such a method that they hope will be reproducible in a simple form that many users can construct for themselves. First it must be submitted to the Bureau of Standards for approval and checking and then to the principal factors in the plastics industry. On their approval the testing method and apparatus would be submitted for approval by manufacturers, processors, distributors, testing laboratories and consumers before promulgation as a commercial standard.

Other interested groups

Other groups testifying for plastics before the House Committee were the Pyroxylin and Resin Coaters Institute representative who spoke in favor of the bill but suggested that it be amended to eliminate a "flammable" label for goods not intended for use in the garment industry.

Mose Zweibel, head of the Plastics Products Manufacturers Association, representing a group of cellulose nitrate fabricators employing over 1,000 workers, asserted that his group would be forced out of business if the section referring to ornaments is passed as written; that he had no record of a serious accident ever caused by a nitrate ornament or wearing apparel; and scored a point when he informed the Congressmen that campaign buttons are one of the principal products that would be legislated out of existence if the bill as now written should become law.

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The Special G. M. C. Process*

SUN glasses are sun glasses—until you decorate them with the special G. M. C. process that deposits precious metals directly on plastics in any pattern you desire—adding new distinctive beauty. The decoration is permanent since it is integrally bonded to the sales material.

One pair of these glasses, decorated for Zylo Ware Corporation, shows an overall deposit of gold; the other pair bears a complicated silver pattern. Both are made strikingly different by the G. M. C. Process which lends new sales appeal and beauty.

Sun glasses, of course, are only one of many plastic products that we decorate. G. M. C. can give your product, whatever it may be, a novel and artistic decorative finish in any pattern or design—with any metal, precious or otherwise.

Let us show you what we can do. *Pat. Pending

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Whatever your pressing or lifting requirements, it will pay you to consider the use of Hein-Werner Hydraulic Jacks. Made in models of 1½, 3, 5, 8, 12, 20, 30, 50 and 100 tons capacity. For details, consult nearest industrial supply distributor, or write us.



Illustration at left shows Model 20.10AA of 20 tons capacity.

Hein-Werner
HYDRAULIC JACKS

HEIN-WERNER CORPORATION, WAUKESHA, WIS.



Plastic-coated wire

A NEW twist to gift and commercial packaging has been added with the introduction of Plexon Pigtail, a pliable plastic-covered wire. This wire, which comes in 15 colors, including gold and silver, lends itself readily to decorative purposes.

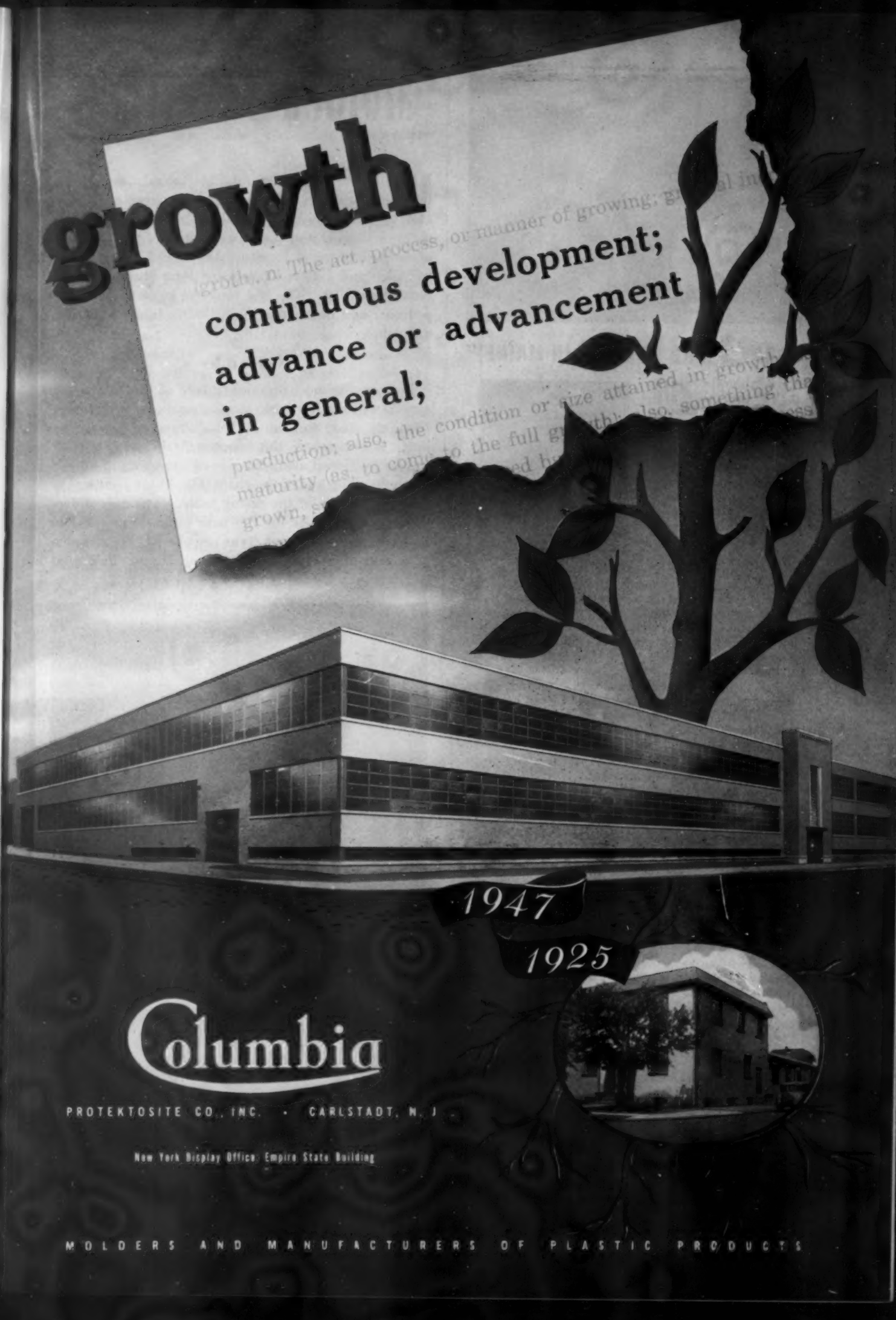
Easily bent and manipulated, it can be braided for greater color detail and finished with spirals or twists, or two or three strands may be twined into a knot or bow. As illustrated above, it can be closely wound around the neck of a bottle for good grip and to enhance the appearance of the bottle. Other glassware can be treated in the same manner.

In the florist trade, it may be substituted for wire which ordinarily holds the flowers in place and for decorative ribbons or foils as well. Only a single operation is required. As a flower box wrap, it is fastened on top with small natural blossoms.

The colored wire has also proved advantageous in displays where wire is often necessarily visible. For example, for silhouettes, the wire can be formed into a three dimensional design.



Plastic-coated wire, supplied in many colors, may be substituted for ribbon, uncoated wire and foils in the florist trade—eliminating extra handling of flowers


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continuous development;
advance or advancement
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1947
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MOLDERS AND MANUFACTURERS OF PLASTIC PRODUCTS



"BY GORRY, I LIKE TO WORK IN MAINE!"



"NEVER thought much about it 'til the other day someone said to me 'Lester, how do you like your job?' This kind of set me to thinking. I have worked in this woolen mill for 24 years. Never worked in but one other plant. I like my job. I like the folks that I work with and I like the folks that I work for.

"Now when it comes down to why I like my work, there are many reasons. I am a weaver, and I like to see perfect cloth come rolling off the machine. In the 24 years I have been able to make a few suggestions to my boss that have made improvements. Whenever I get a chance I like to go into the finishing room, and sometimes into the shipping room. I like to see this beautiful cloth rolled up and shipped out. I take the same pride in the cloth going out of this mill that I do in my own garden.

"On the small farm that I own just outside of the village, I have a mighty good garden every year. If I can get green peas by the Fourth of July, or raise a squash a little bigger than my neighbor's, I feel pretty good about it. I have always kept a cow, and I am always mighty sure she is a good one.

"I have raised a family and educated them. Every one of them has a better education than I have. Some of them have settled right down here in the town.

"Another thing that makes me like my job is the fact that I like to go fishing. In the summer months, there is plenty of time after work to drive to a stream or lake nearby, where I can get some fine trout fishing.

"So you see, it is easy to understand why I like my job. I like to make good cloth, I like my garden and I like to go fishing. I find most of the workers about me feel just the same as I do."

Lester V. North

What Lester North says, if carefully analyzed, constitutes an invitation for you to establish your industry in Maine. The State of Maine takes great pride in its industrial workers. They are capable, loyal and happy. The success of any industry depends on the quality of its workers.

If you are thinking of moving, expanding or decentralizing, it will pay you to investigate the industrial possibilities of the State of Maine. Send for the free booklet "Industrial Maine".

STATE OF MAINE PLASTICS INDUSTRY

MAINE DEVELOPMENT COMMISSION, STATE HOUSE, AUGUSTA, MAINE

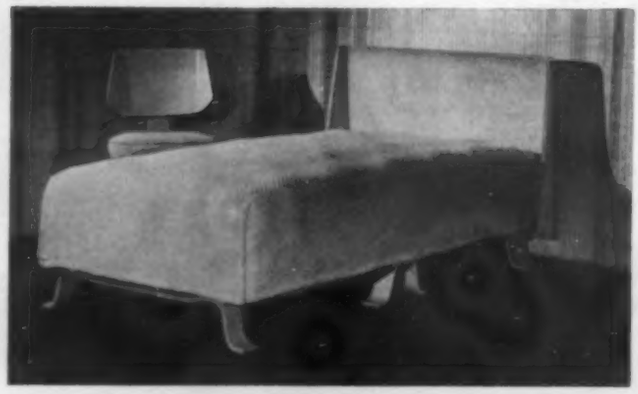
Molded furniture

MODERN lines; natural, blackwood, mahogany and variously colored lacquer finishes; resistance to heat, moisture and alcohol; and marked resistance to wear and tear are qualities of the new line of molded plywood furniture that has been designed by Allen and Edwin Kramer for John Stuart, Inc., of New York City. The first pieces to go on sale include a dining and occasional chair, dining table, beds and a couch.

Versatility

Perhaps the most unusual feature of this line is the way in which a few basic shapes, produced in different sizes, are made to form all the different pieces in the line. For instance, the headboard shown in Fig. 1 can be positioned along the side of box springs to make a couch. The legs of the chair (Fig. 3) are identical in form to the legs of the dining table. The only difference is in size. As for the base supports of the bed and couch, two different styles are offered (Fig. 2), each of which is reversible. Thus an almost unlimited

1



2



Phenolic resin-bonded birch or maple veneers are molded to form the units that make up this line of furniture

combination of base supports can be achieved to suit the taste of any purchaser. Since these base units slide along the floor, the usual casters or rollers are unnecessary. These base units can be used for book cases, bureaus and other pieces.

The flexibility of the molded plywood has been put to excellent account in the chairs. Because of this resiliency, the back support can be adjusted through three positions to accommodate persons of varying sizes and weights. The stiff position gives near rigid support while the soft position approximates the spring of a fully upholstered back. The furniture is remarkably light without sacrifice of strength.

Bakelite phenolic resin glue is used in bonding the birch and maple veneers used in this furniture. The time required to cure the pieces varies from 10 to 15 min. for small parts to 35 min. for the table leg.

A typical production run

The processing of one of these pieces, a chair leg for example, will give an idea of the time, temperature and pressures required. Eight plies are used for one of these legs which is approximately $^3/_4$ in. thick. Formed in male and female steel dies, the leg takes 18 min. to cure with a 250° F. temperature and pressure 150 p.s.i.

In the case of all the parts that comprise this new line of furniture, the finishing is the same as in the manufacture of long established furniture lines. It is simply the regular run of woodworking.

3



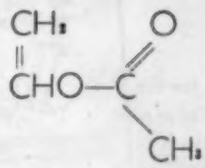
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Cast phenolic control housing

A NEW and very interesting use of cast phenolic is to be found in the elevators now being built by the American Elevator and Machine Corp. of Louisville, Ky. In these elevators the control housing as well as the knobs on the control panel are of cast Catalin. The idealized sketch below shows all of these applications while the photograph shows the top and underside of the control housing.

Two different pieces

The castings for the control housing and knobs is the work of the Catalin Corp. of America, the finishing being carried out by the National Fabricating Corp. of Ozone Park, N. Y. The numbers on the knobs are engraved into the plastic material after casting and subsequently filled with a liquid resin of a contrasting color by a process patented by the National Fabricating Corp. While any color cast phenolic could be used for this application the samples shown in the accompanying illustrations are a very deep and rich maroon.

In addition to the beauty imparted to a control panel of this type by these cast phenolic parts, the Catalin control housing and knobs are practical, being chemically inert and having good dimensional stability. The excellent machining qualities of this plastic are evident in housing photo.

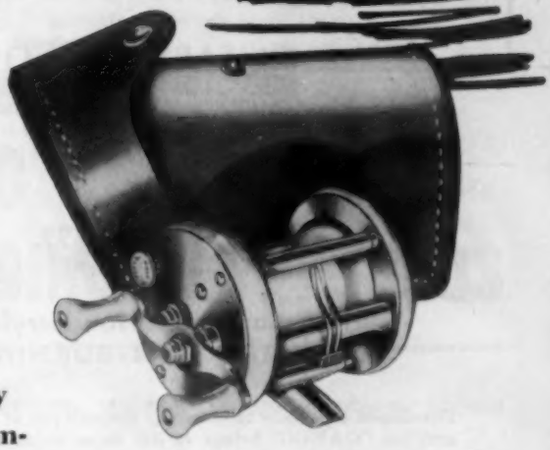




A new use for cast phenolic is to be found in elevators where it is used in the control housing and in control knobs



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Cellulose acetate is used to incase roller for iron cord

Plastics are at home

DURABILITY, safety, minimum cost, heat resistance, attractive appearance and color possibilities were among the reasons plastics were selected for use in a number of new, well-designed household appliances. Cellulose acetate, phenolic, cellulose acetate butyrate and a new luminous thermoplastic material, used in the products illustrated on these pages, were each adopted for the special quality they could impart to the molded piece.

The appliances are: Com-Bac ironing cord produced by Searle Aero Industries, Inc. of Orange, Calif.; Glide-O-Matic iron, a product of Century Precision Works, Inc., of Irvington, N. J.; automatic toaster, manufactured by Sunbeam Corp. of Chicago, Ill.; Aladdin knife sharpener, put out by the New England Carbide Tool Co., Inc. of Cambridge, Mass.; luminescent tumbler, curtain or electric pull, put out by McCallum, Devitt & Ford of Chicago, Ill.

Twisted cord eliminated

The Com-Bac iron cord features a retractor-spring attached to a plastic incased roller which holds cord

This iron has sturdy phenolic handle with glossy finish





Here, phenolic offers good contrast to chrome of toaster

in the kitchen

at proper ironing level, prolongs cord life, prevents tangling and practically eliminates the danger of short circuiting. Walter Schott Co. of Los Angeles, Calif., supplies the heater plug and cord. The roller housing of Tenite is injection molded by Olympic Plastics of Los Angeles, Calif., in a 4-cavity mold—two right hand and two left hand cavities. The molding cycle is between 30 and 60 seconds. Sanding off of the gate is all the finishing required. Adjustable clamps hold the attachment on the ironing board.

Good appearance needed in iron

The makers of the Glide-O-Matic iron needed a sturdy handle which would add to the appearance of the iron and which could be produced at comparatively low cost. A handle with a smart gloss finish was preferred. The problem was solved by Shaw Insulator Co. of Irvington, N. J., who produced Bakelite and Resinox handles from a 4-cavity semi-automatic transfer mold.

As in the case of the iron, a material which was self-insulating against heat was required for the Sun-

Butyrate housing for sharpener comes in many colors



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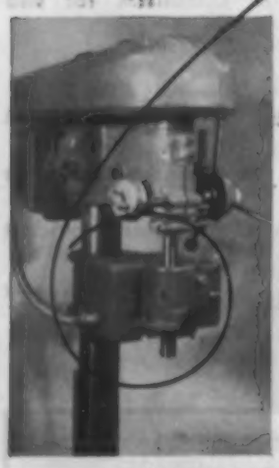
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Shade pull and tumbler are white during day, blue at night

beam toaster. The base, two handles and two control knobs of the toaster are molded from Durez by the Chicago Molded Products Corp. of Chicago, Ill. The contrast between the glossy black plastic and chrome-plated body adds to the beauty of the automatic toaster. The toaster has a thermostatic control which can be adjusted to any shade of toast desired and which can be set to either eject the toast or keep it warm until wanted.

Tungsten carbide with plastic

A precision knife sharpener utilizing tungsten carbide cutting tools—one of the hardest metals made—and a plastic housing has been developed by the New England Carbide Tool Co. Tenite II is used for the housing which is injection molded by Plast-O-Matic Co. of Fitchburg, Mass. The various parts of the Aladdin sharpener are pressed into proper place or held in place by screws. The wide range of color possible with cellulose acetate butyrate was one of the reasons for its selection.

Non-toxic luminous appliances

Paulite, a thermoplastic mixed with certain types of pigments to render it luminous, has been announced by McCallum, Devitt and Ford. Pigments are supplied by the New Jersey Zinc Co. of New York City. A variety of items, including tumblers, electric light pulls, street numbers are made from this material.

White in daylight, Paulite becomes blue at night. However, to glow successfully it needs to be exposed to light preceding periods of darkness. The tumblers, shown here, have a safe drinking edge, do not break easily, are said to be non-toxic and can be washed in water up to 180°. Pulls eliminate groping in the dark for light cords or window shades.

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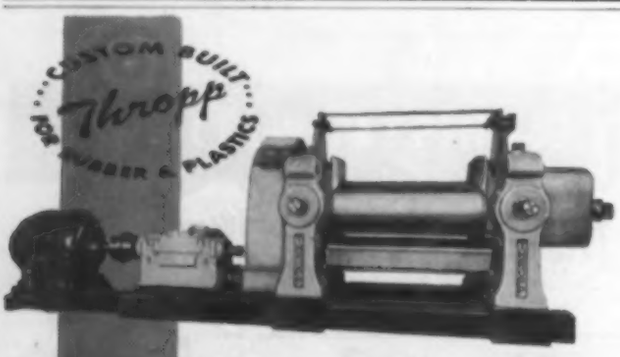
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Old cardboard, new acetate containers are contrasted

Acetate containers

MERCHANDISING in cellulose acetate containers is not new. Ever since the development of this plastic, packaging has been considered one of the best fields for this material. The transparency of the material puts the product to be sold in full view of the consumer, yet protects the product from unnecessary handling, dust and dirt.

Until the war the Royal Hair Pin Corp. of New York City merchandized its bobby pins on the familiar cardboard cards. Since 30 pins were sold at one time this meant that there were 30 steps necessary to assemble the package since each pin had to be slipped into place individually. Labor became more and more difficult to obtain so the company hit upon the idea of packaging their "coiffure keys" in small cardboard boxes. This meant reducing 30 steps to one operation as the counted pins could be slipped into the box with one motion.

While the cardboard box met with good reception the company was not satisfied with it. The container had a tendency to bend and even fall apart when carried a short time in a woman's handbag. And it offered no means of displaying the pins to a prospective consumer.

Cellulose acetate containers seemed to provide the best solution. It showed off the pins and had reuse value. A consumer could carry the container in her purse indefinitely and was saved the annoyance of digging to the bottom of her bag for stray pins.

Celluplastic Corp. of Newark, N. J., makes the containers of Clearsite. A solvent method is employed. The container is $^5/_8$ in. in diameter by 2 in. long. Printed matter is enameled on the outside of the cellulose acetate container in white, red and blue. Royal still markets the cardboard package as well as the acetate package, but employs different outlets.



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Books and Booklets

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Injection Molding of Plastics

by Islyn Thomas

Published by Reinhold Publishing Corp., 330 W. 42nd St., New York City, 1947

Price $10.00 **540 pages**

For the plastics engineer, the product and mold designer, the shop foreman, and the student of plastics—a detailed, specific and thoroughly practical coverage of the history, development and mechanical problems involved in injection molding. This is a unique volume indeed, written by an engineer of great competence and broad experience, from the point of view of shop practice. An idea of its scope may be gained from the fact that it contains over 500 illustrations (including five color plates), most of which deal with the mechanical details of presses, mold design and operating techniques. Everything of any importance regarding injection molding is recorded, and up-to-date methods of designing, machining and utilizing molds with all types of plastic molding materials are fully and painstakingly described. This book will be invaluable to everyone engaged in molding plastics by the injection method and will serve as an admirable textbook in technical schools and colleges.

F. B. S.

Metallizing Non-Conductors

by Samuel Wein

Published by Metal Industry Publishing Co., Inc., 11 W. 42nd St., New York 18, N. Y., 1945

Price $2.00 **62 pages**

The six chapters of this book deal with the history behind metallizing, with mechanical films, chemical reduction films, cathode sputtering and metal spraying, metallic paints and plating. Special emphasis is placed on silvering and coppering.

Rayon Industry of Japan

by H. Wickliffe Rose

Published by Textile Research Institute, Inc., 10 E. 40th St., New York 18, N. Y., 1946

Price $6.00 **340 pages**

This report is the result of a Mission sent to Japan for the purpose of determining the productive capacity, potential capacity and types of products, and in general answering the economic questions faced by that country. Although covering all aspects of the rayon industry, this book also includes a discussion of such synthetic fibers and materials as polyvinyl alcohol and polyamide fibers, produced commercially, and fibers from glass, casein and soybean.

Textile Chemical Specialty Guide, 1946-47 edition

Edited by H. R. Mauersberger

Published by Textile Book Publishers, Inc., 303 Fifth Ave., New York 16, N. Y., 1947

Price $5.00 **408 pages**

The fourth edition of this guide to the chemical products used in the textile industry, contains the offerings of 193 American manufacturers and lists them first by company then according to their use. Under the latter classification are found all the acids, detergents, boil-off assistants, etc., together with the company making them. There is also an alphabetical list of 2000 products and the companies supplying them.

Jigs and Fixtures for Mass Production

by Leland A. Bryant and Thomas A. Dickenson

Published by Pitman Publishing Corp., 2 W. 45th St., New York 19, N. Y., 1947

Price $3.50 **222 pages**

This book devotes particular attention to assembly tooling and traces the history of jigs and fixtures and their relation to industry as a whole, not just to the machine shop. Plastics, pneumatics and hydraulics as applied to tooling are thoroughly covered as are the designing and construction of the various types of jigs and fixtures.

The Production and Properties of Plastics

by S. Leon Kaye

Published by International Textbook Co., Scranton, Pa., 1947

Price $5.00 **612 pages**

This detailed technical book should serve an important purpose as it stresses the relationships between all raw materials, plastics materials and the various sections of the industry.

In addition to its coverage of material production, processes and chemistry, it offers complete sections on the properties and tests of plastics, on molds for plastic products, on design and also deals with laminations, coatings, finishings, etc.

Although not written for continuous reading, it has decided value for molders, fabricators and processors. Included are a number of shop hints and procedures taken from the author's wide experience, as well as a notable section on estimates, complete with charts and methods of cost calculation.

DC silicones—The third edition of the DC Silicone Catalog has just been issued by the Dow Corning Corp., Midland, Mich. Containing many charts and graphs descriptive of the properties of the family of organo-silicon-oxide polymers, this booklet covers DC silicone greases, fluids, varnishes, resins and elastomers.

Insulating varnishes—36 grades of G-E insulating varnishes are described in a 40-page brochure recently published by the Resin and Insulation Materials Div., General Electric Chemical Dept., Pittsfield, Mass. This attractive booklet includes specifications, electrical properties, film properties, cure and aging, chemical properties and baking and air drying cycles of each type.

Wire and cable insulation—A 16-page report concerning Zyrox Brand Saturants as cotton and asbestos impregnants is now available from Bakelite Corp., 30 E. 42nd St., New York City. The properties, with emphasis on the saturants' low viscosity at operating temperatures, and applications of these compounds for treating fibrous materials used in electrical insulation are discussed.

Plastic surface material—Home, store, office, hotel and transportation uses of Decorative Micarta, manufactured by Westinghouse Electric Corp., are outlined in a new brochure obtainable from United States Plywood Corp., 55 W. 44th St., New York 18, N. Y.

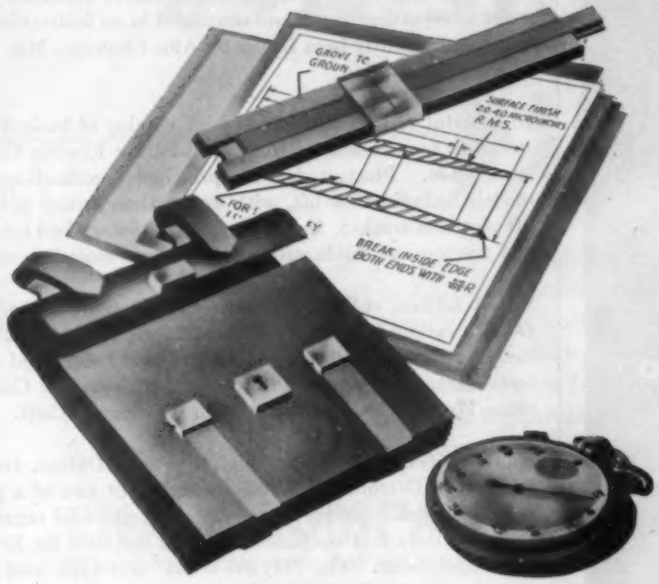
Leather belting—The application and operation of leather Vee belting are explained in a pamphlet just released by the S. R. Sikes Co., 1028 So. Third St., Minneapolis 15, Minn. Included is a price list on leather Vee belting metal couplers and installation clamps.

Pulverizers—The Pulverizing Machinery Co., Chatham Rd., Summit, N. J., has just

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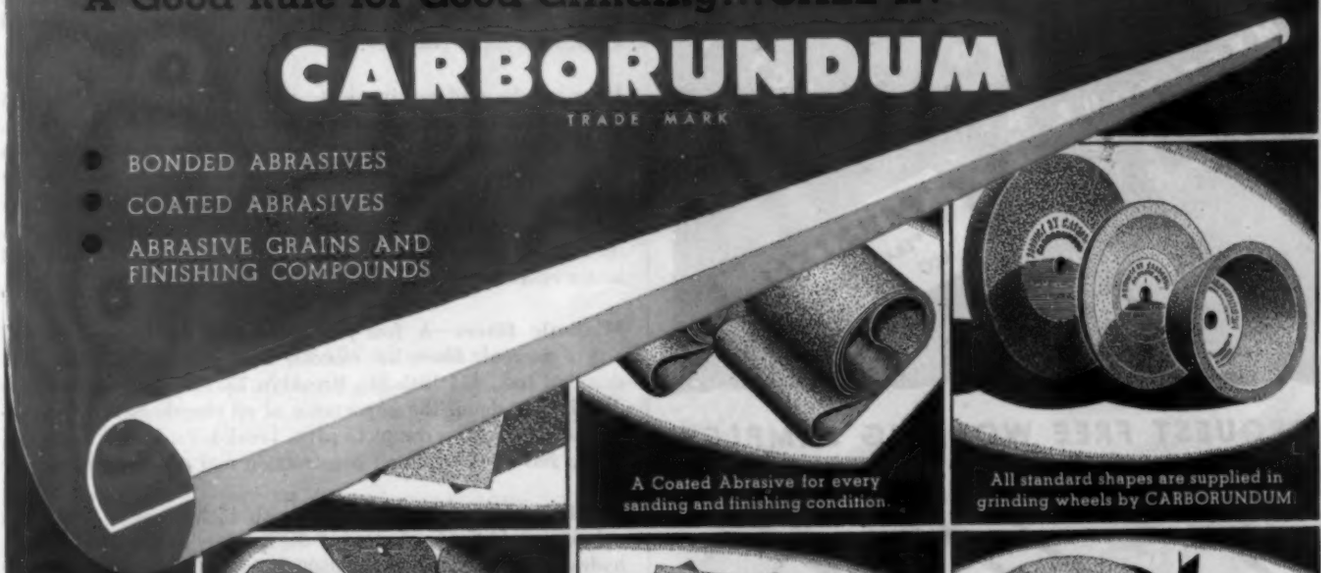
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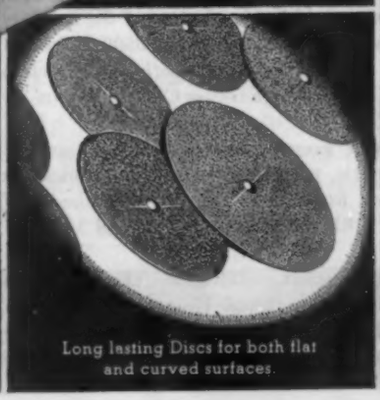
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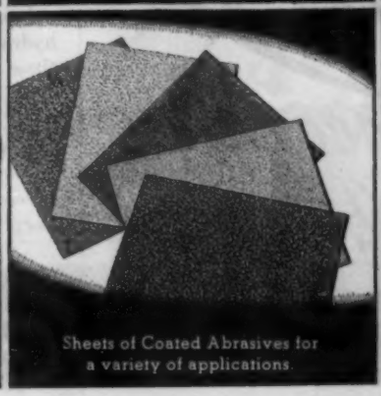
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published a pamphlet supplementing their recent announcement of the Mikro-Atomizer. Both this pulverizer, which produces microscopically fine powders, and the Mikro-Pulverizer for less minute work are discussed individually and also with reference to their applications in various industrial fields in the grinding of plastics, resins, pigments and food products.

Water conditioning chemicals and equipment—The importance of feedwater control, the care of testing equipment, obtaining samples, test procedures and handy reference tables to assist in reporting results are contained in an instruction booklet which has recently been issued by Allis-Chalmers Mfg. Co., 710, Milwaukee 1, Wis.

Industrial trucks and cranes—A catalog of basic models for 1947 has been issued by the Elwell-Parker Electric Co., Cleveland, Ohio. Illustrated, with principal specifications, are 31 models including low-lift, with and without crane units; high-lift platform trucks; the fork-type; stationary-bed load carriers and tractors, available with electric or gas-electric power.

Speed lathes, collets, turrets—Crozier time-saving tools, including various models of the vacuum-grip speed lathe, tool post turrets equipped with cutting-off tool and holder and collet attachments, are described in Catalog 46-1, issued by Crozier Machine Tool Co., 684 N. Prairie Ave., Hawthorne, Calif.

Dust collector and spray booth—Peters-Dalton, Inc., 17900 Ryan Rd., Detroit, Mich., has brought out two of a projected seven bulletins intended to provide the industrial engineer with pertinent data and simplified selection methods for little-publicized equipment. The "Hydro-Whirl" wet type dust collector and the "Hydro-Whirl" wet type spray booth are the subjects treated in Bulletins 101 and 201.

Plastics abstracts—Each month The British Plastics Federation, 47–48 Piccadilly, London, W. 1, publishes abstracts covering all journals dealing with plastics. Abstracts may be obtained for 5/6d a copy, post free.

Hose masks and equipment—Complete information, including construction, operational details and industrial applications, on M. S. A. hose masks (designed to safeguard workmen from high concentrations of gas) and auxiliary equipment is contained in Bulletin No. EB-5 recently published by Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh, Pa. Also featured are M. S. A. Air Blowers, of both the hand and motor operated types.

Micronic filters—A four-page pamphlet illustrating its full line of micronic filters has recently been released by Greer Hydraulics, Inc., 454 18th St., Brooklyn 15, N. Y. The brochure describes in detail the importance of oil cleanliness, and an exploded view with a complete parts breakdown is also included, giving full information on construction and materials used.

Fluid pumps—Quiet operation with high pressure and high volume is said to be a feature of the recently announced Denison hydraulic fluid pumps of the 3500 Series. The specifications for these pumps appear in Bulletin P-1, which may be obtained from The Denison Engineering Co., Columbus 16, Ohio.

Oil and grease pumps—Oil and grease pumps for manual, automatic, motor-driven and mechanically driven operation are covered in Bulletin 469 just published by Trabon Engineering Corp., 1814 E. 40th St., Cleveland 3, Ohio.

British export catalogue—The Gauge and Tool Makers Association, Standbrook House, Old Bond St., London, W. 1, has issued an "Export Catalogue" in English, French, Spanish, Russian and Portuguese. This book contains illustrations and descriptive matter, and covers all the products manufactured by

LARGE *Quantities* NOW *Available—*

ISOBUTYLENE

For the first time in chemical history pure isobutylene is now available for delivery in substantial quantities. This raw material shows great promise as a reactive hydrocarbon in the synthesis of chemical compounds. Because of its reactivity and low cost it is particularly well-suited to the production of polymers in the resin and rubber field.

As marketed by Enjay, isobutylene has a high degree of purity. Ask for further details, including availability, price and technical service to aid in the proper application of this material.

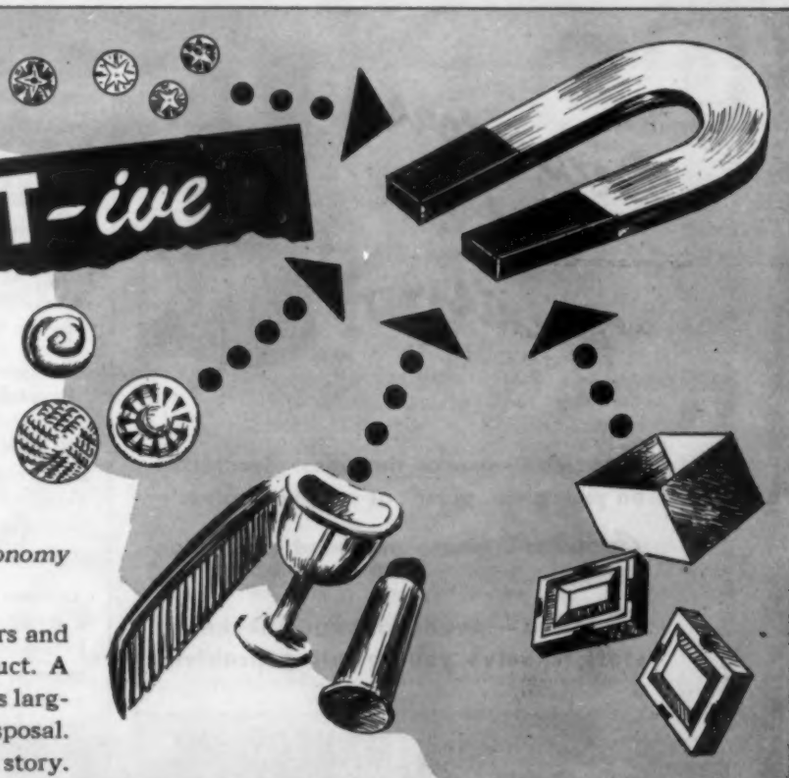
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the 200 members of the Association for overseas export. A general index and a buyers' guide index are also included.

Close-coupled centrifugal pump—The Quimby Pump Div. of H. K. Porter Co., Inc., 1932 Oliver Bldg., Pittsburgh 22, Pa. has just released an eight-page pamphlet on their close-coupled centrifugal pump. Designated as Model "Q," the pump is designed for general service with capacities from 10 to 1000 G.P.M.

Hydraulic pallet lift truck—Lyon-Raymond Corp., 3125 Madison St., Greene, N. Y. has released a new bulletin on hydraulic pallet lift trucks. Photographic illustrations show method of operation with pallets, recommended pallet construction and adaptability of various materials to palletizing.

Jaquet speed indicator—This chronometric type tachometer, which measures r.p.m. over a fixed period of 3 or 6 sec., is illustrated and discussed in Catalog No. 735 of Herman H. Sticht Co., Inc., 27 Park Place, New York City. Four different models of this speed indicator are available, covering all ranges from 0—100,000 r.p.m.

Auxiliary publications in microfilm—The American Documentation Institute, 1719 N Street, N. W., Washington 6, D. C., has published a listing of documents which may be obtained in microfilms or photoprints. Publications available in this form, include those on organic chemistry, textiles and chemical analysis.

Slide-contact rheostats—Rex Rheostat Co., Baldwin, L. I., N. Y., has brought out a booklet explaining their various types of resistors and rheostats and stating the specifications for and capacities of these types.

Plastics "Primer"—"Plastics—the pressure processing of synthetic resins," an analytical bulletin prepared by Hydraulic Press Mfg. Co., Mt. Gilead, Ohio, is now available in Spanish translation. Diagrams and photographs illustrate this survey of plastic materials and fabricating processes.

Storage of microfilms, sheet films and prints—To aid business and industrial organizations, as well as photographic concerns, in solving problems of storing films and prints exclusive of nitrate films, Eastman Kodak Co., has issued a new pamphlet entitled "Storage of Microfilms, Sheet Films and Prints."

Accident prevention—After two and a half years of research, the National Safety Council has published its new 544-page manual, "Accident Prevention Manual for Industrial Operations." This manual, covering such subjects as plant design and layout, chemical hazards, flammable liquids, construction, etc., may be obtained from the National Safety Council, 20 N. Wacker Drive, Chicago 6, Ill.

Flowrator dimensions—Fischer & Porter Co., Hatboro, Pa., has combined into a single bulletin a complete set of certified dimensions covering every available combination of the Series 700 Flowrator instrument (rotameter). This engineering composite includes various types of indicating Flowrator instruments, along with panel mounting arrangements, alarm attachments, electrical transmitters, pneumatic transmitters and recorder-controller accessories.

Automatic temperature control systems—Charts, tables and diagrams explain measurements, automatic control and the selection of proper control systems for process applications in Educational Bulletin No. 5, recently published by Wheelco Instruments Co., 847 W. Harrison St., Chicago 7, Ill. The placement and selection of thermocouple protecting tubes are also separately treated.

Electric lift truck—Newly released by Lewis-Shepard Products, Inc., 325 Walnut St., Watertown 72, Mass., is an 8-page illustrated booklet on their electric Power Jacklift. Platform model of the Jacklift is available in several platform widths and lengths and in 4000 and 6000 lb. capacity; pallet model in several fork lengths and 4000 lb. capacity.



STEERING FOR STYLE WITH *Plexiglas*

Colorful and distinctive steering wheel medallions ingeniously molded of PLEXIGLAS to give a three-dimensional effect are attractive centers-of-attention in many new cars. The effect is produced by molding the acrylic plastic with the design on the back surface only, then decorating the pattern with paint, metal spray or metal leaf to bring out the various elements in a realistic relief. The design appears as an object imbedded within the PLEXIGLAS.

This novel application is but another of the increasing number of uses automotive designers are finding for this easily molded plastic. PLEXIGLAS is light in weight, unusually strong, shatter-resistant and permanent, retaining its crystal clarity or gem-like color.

Radiator ornaments, instrument lenses and dials, interior trim, tail and stop lights and many other parts are made of PLEXIGLAS. For detailed information, call or write our nearest office: Philadelphia, Los Angeles, Detroit, Chicago, New York . . . Canadian Distributor: Hobbs Glass, Ltd., London, Ontario.

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Plexiglas
Acrylic Plastic Sheets and Molding Powders

PLEXENE M

a promising new modified styrene co-polymer molding powder . . . weather resistant . . . heat resistant . . . gasoline resistant . . . available at recently reduced prices. Ask for details.

PLEXIGLAS and PLEXENE *are trade marks, Reg. U. S. Pat. Off.*

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Germicides • Chemicals for the Leather, Textile, Ceramic, Rubber, Paper, Petroleum and other Industries

New Machinery and Equipment

Flaw detector—General Electric Co., Pittsfield, Mass., has introduced a flaw detector for detecting and counting holes, weak spots and conducting paths in thin materials such as paper, sheet rubber, sheet mica, varnished cloth, enamel films on wire and plastics materials such as acetate. It can be applied to continuous inspection of such sheet material moving as fast as 250 ft. per min. and wire up to 100 ft. per min. and will indicate when flaws are present or when the flaws that are detected exceed a certain number. Used



for materials up to 0.025 in. in thickness, the detector can be made to operate an alarm, a recorder, or to shut down the process. Two units can be used so as to simultaneously detect major flaws and apply a high pot-test to the parts of the material containing no flaws.

Equipment consists of an electrode assembly in contact with the material and an electronic circuit which detects the slightest flow of current through the material. It operates by applying a high potential to the material and detecting the current flow. The applied voltage is adjustable so equipment can be applied to any material with insulating properties.

Ball bearing grinding attachment and brass collets—South Bend Lathe Works, 442 E. Madison St., South Bend, Ind., has developed an electric grinding attachment for use on lathes and other machine tools. Designed primarily for precision external grinding, it is equipped with a 4 by 1/2-in. grinding wheel driven by a constant speed continuous duty 1/4-hp. motor. Spring stops for grinding straight and spiral fluted reamers and cutters, diamond dressers for truing the grinding wheel and holding fixtures for the dressers can be furnished. Grinding wheels are available in several grades for grinding various materials including tungsten carbide, tool steel, machine steel, cast iron, brass or bronze, aluminum, phenolic, hard and soft rubber. Special cup wheels are supplied for reamer and cutter grinding.

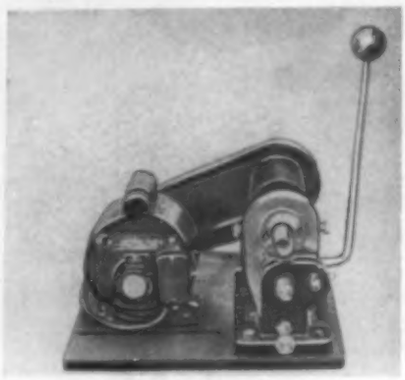
The company has also announced a new line of precision draw-in collets of brass. Although not intended to replace the more expensive hardened steel collets, they are manufactured to the same exacting tolerances. They are especially desirable for odd sizes used only occasionally. However, it is said that they will give good service and can be used for short run production jobs. When worn, a brass collet can be re-bored to a larger diameter. Another advantage is that they can also be machined for holding tapers or irregular shapes. The collets are made in standard fractional sizes, 1/16-in. capacity up to maximum capacity of the collet in increments of 1/64 inch. They are also available with decimal hole sizes for any diameter between 0.0625 in. and maximum capacity of collet. Collets with metric hole sizes are supplied in increments of 1/2 mm., any size between 1.5 mm. and the maximum metric collet capacity.

Polishing and buffing lathe—For finishing small parts, color buffing, brushing and light cut buffing and polishing, Hammond Machinery Builders, Inc.,



1600 Douglas Ave., Kalamazoo 54, Mich., has introduced Model ROL single speed polishing and buffing lathe. This lathe has an 8-in. overhanging spindle to provide liberal working space, is furnished with 2 or 3 hp. motors and is multi-V-belt driven from motor mounted inside the base. Any spindle speed from 1200 to 3600 r.p.m. can be obtained. The motor is mounted on hinged motor plate for easy adjustment of belt tension. The company has also announced a new polishing machinery catalog, No. 55, which carries specifications covering their complete line of polishing and buffing machinery.

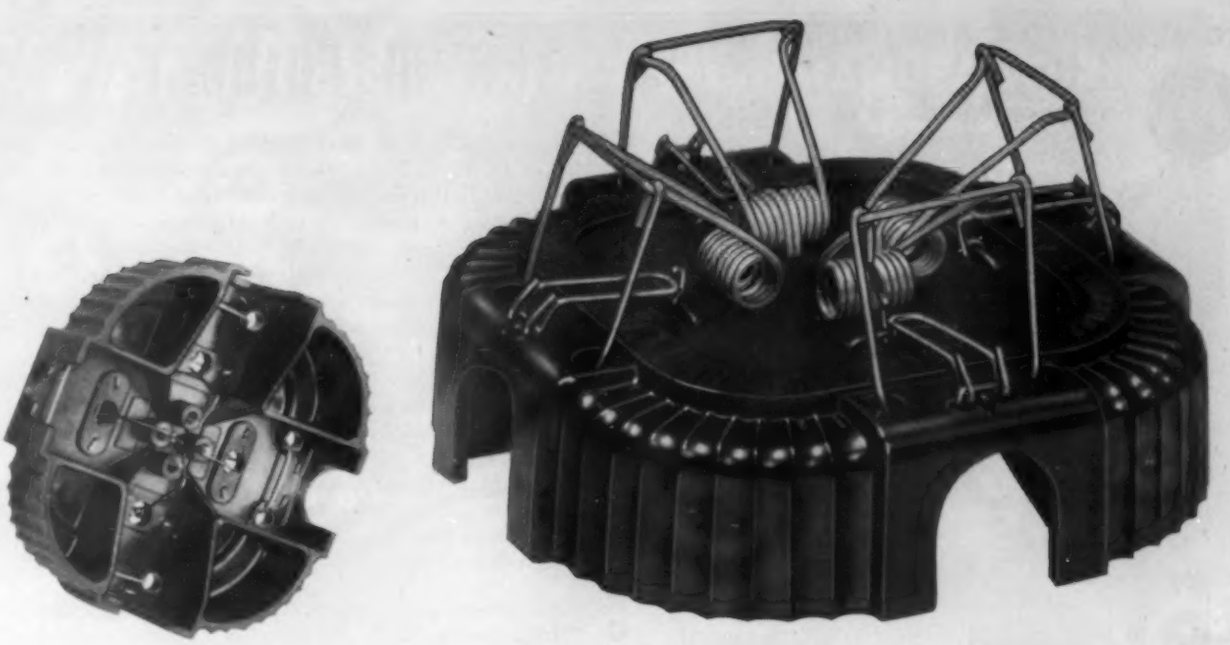
High speed deburring and chamfering machine—Beach Machine Works, 515 Long Beach Blvd., Long Beach, N. Y., has introduced a new high speed deburring and chamfering machine for facing, deburring and chamfering in a single operation on ferrous and non-ferrous metal and plastics. Model A can take work from 3/16 to 2 in. in outside diameter



while Model B can take work up to 3 1/2 in. outside diameter. An operator has one hand free to place and remove work from machine which means that 300 to 500 pieces can be completed per hour. Cutter tools can be supplied to do different operations—a ball end, for example, on hexagonal or round solid material or a single long chamfer put on the outside or inside of round stock for welding.

Motor-driven hand miller—H. B. Rouse & Co., 2214 1/2 Wayne Ave., Chicago Ill., has developed a high speed, ball bearing, motor driven hand miller for rounding and burring operations. The spindle is adaptable for either small circular milling cutters or small end mills. The machine is particularly effective on finishing operations where light cuts are required and can be used on plastics, the lighter steels, aluminum and brass. Power is delivered from a 1/4 hp. motor with a shaft speed of 1750 r.p.m. With the pulleys that are furnished, the machine can be run at 3500 or 850 r.p.m. Other size pulleys can be used to decrease or increase this speed. The standard unit has 1/2-in. hole to hold any small cutter with 1/2-in. straight shank.

(Please turn to page 206)



Automatic Molding

BUILDS THAT "BETTER MOUSE TRAP"

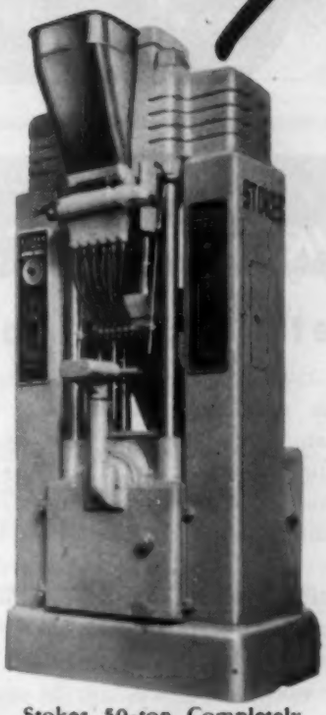
This new plastics "Choker" trap, molded by Animal Trap Company of America at Lititz, Pa., is further evidence that it pays to Mold Automatically . . . that Completely Automatic Molding reduces labor cost to an insignificant fraction of the total per piece . . . that it produces highest quality moldings, in quantities geared to daily production, at the lowest possible cost.

This molding is produced on 3 Completely Automatic 50-ton Presses, in 2-cavity molds, at the rate of 1646 pieces per day per machine. These machines were selected for a number of reasons, most important of which were:

- Mold . . . 2 cavities only, low cost, quickly made, quickly put into production.
- Moldings . . . necessarily of highest quality because produced under identical conditions. Few rejects. No assembly difficulties. Molded as required. No large inventories.
- Cost . . . material, heat, power and labor, only $30.60 per thousand. Of this total, material (Phenolic) costs $28.60 *and labor is only 80 cents.*

When you can Mold Automatically, you can save money in many ways. Consult with us. Ask for cost estimates. Send samples or sketches.

F. J. STOKES MACHINE COMPANY, 5934 Tabor Road, Phila. 20, Pa.



Stokes 50-ton Completely Automatic Molding Press. Patented in U.S. and abroad.

F. J. Stokes MOLDING EQUIPMENT FJS

COMPRESSION AND INJECTION • MOLDMAKERS AND CUSTOM MOLDERS

Injection Molded Poker Chips



Tooled to build efficient molds for fast economical production . . . **Experienced** in planning and delivering millions of Customolded parts . . . **Skilled** in meeting precision specifications on difficult operations. Name your Customolding requirements. Midwest will measure up.

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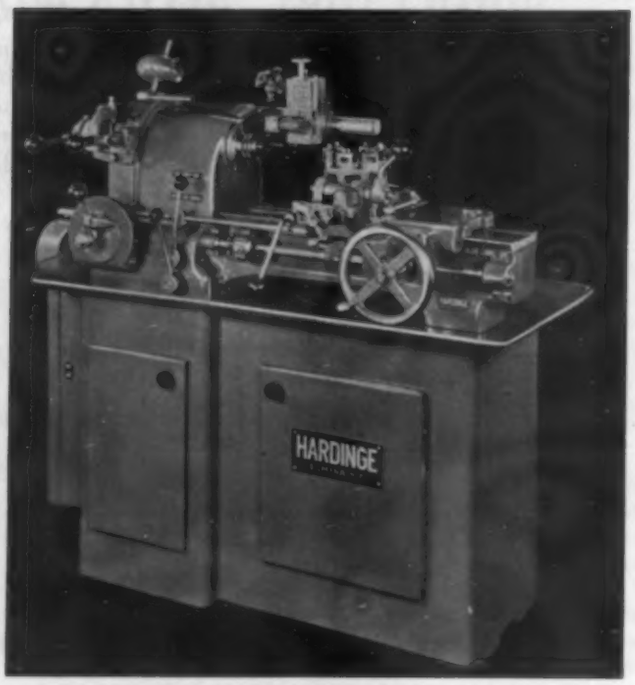
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New machinery

Speed enameler—Ronci Machine Co., 2 Atlantic Blvd., Centredale 11, R. I., has introduced a combination dipping-whirling machine in two sizes, Models R-100 and R-200, for coating large quantities of small parts with lacquer, enamel, paint or other liquid finishing material. Since material is enclosed in a machine, there is said to be little evaporation. There is always a solvent atmosphere necessary for proper leveling on parts being coated.

Model R-100 has a work basket of cast aluminum, lined with steel mesh wire, 11½ in. in diameter, depth of 4 in. and capacity of 312 cu. inches. It has a ⅓-hp. motor. Model R-200 has a work basket, lined with steel mesh wire, 16 in. in diameter, depth of 6 in. and capacity of 1206 cu. inches. Hydraulic controls raise and lower work basket and motor equipment consists of an ⅓-hp. explosive proof motor for spinning and an ⅓-hp. explosive proof motor for hydraulic lift. Allowing time for loading and unloading, 20 to 25 complete operations per hour may be obtained on both machines.

Multi-operation chucking machine—Hardinge Brothers, Inc., Elmira, N. Y., has introduced a multi-operation chucking machine designed to fill the gap which has existed between second operation machines and large turret lathes. The new machine is for turning, boring or threading parts up to 6 in. in diameter which have been blanked out on automatic screw machines or turret lathes or for finishing stampings, castings, forgings and other types of work that ordinarily require individual setups. Parts requiring many bored diameters and turned diameters that must be relatively concentric, as well as having a fine finish, can be produced on a rapid production basis.



The turret has eight stations, each of which can be adjusted without affecting other turret stations. This enables final adjustment of the cutting tools without resorting to hammering tools for size adjustment. The turret takes standard ⅜-in. square tool bits or ⅜ by ¼-in. rectangular tools directly on the top surface. Through the use of single, double and triple tool holders, as high as 24 single point tool operations can be performed in one setup. The production threading head is controlled by a precision master lead screw mounted directly on the rear of the headstock spindle. A thread length control automatically lifts the





"...for better plastics products"

YES, SIR! THEY'LL WORK IN PERFECT HARMONY WITH *YOUR* PLASTICS PRODUCTION.

WHATEVER YOU MAKE, THEY'LL HELP YOU MAKE IT—BETTER, FASTER AND CHEAPER!

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REZ~N~DYE

A quick dip *permanently* colors most plastics. No heat, no mixing, no fuss! 21 colors.

$3.30 per gallon F.O.B. Factory

REZ~N~GLUE

Sticks anything to everything—*and how!* Colorless and transparent. Dries in 1 to 2 minutes.

$5.50 per gallon F.O.B. Factory

•

REZ~N~KLEEN

Instantly removes masking tape and all other foreign matter from Lucite or Plexiglas.

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REZ~N~BOND

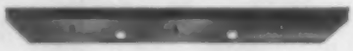
Special bonding agent for Lucite and Plexiglas. Produces invisible junctions—*stronger* than the parts joined!

$4.50 per gallon F.O.B. Factory

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And it's a big help in making more nylons faster.



This is a Verge Plate. One goes into each of the 26 sections of the Full Fashioned Legger and Footer Knitting machine shown below.



Formerly, the United Knitting Machine Co., put them together with rivets and screws. Since a Verge Plate is hit by 250 steel sinkers from 70 to 80 times per minute, the vibration broke them up pretty fast. And then the machine went out of service until the Verge Plate was replaced.

Now, however, these Verge Plates are assembled by bonding a 1/8″ strip of rolled brass to a 3/16″ piece of "Synthane" plastic laminate. And, since the job is done by *Pliobond*, the bond withstands the terrific vibration.

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This is only one of the myriad jobs Pliobond is doing for industry today. We'll be glad to send you full details about Pliobond. Mail the coupon.

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tool from the work at the end of the cut. Threads can be cut within one-half turn from the shoulder.

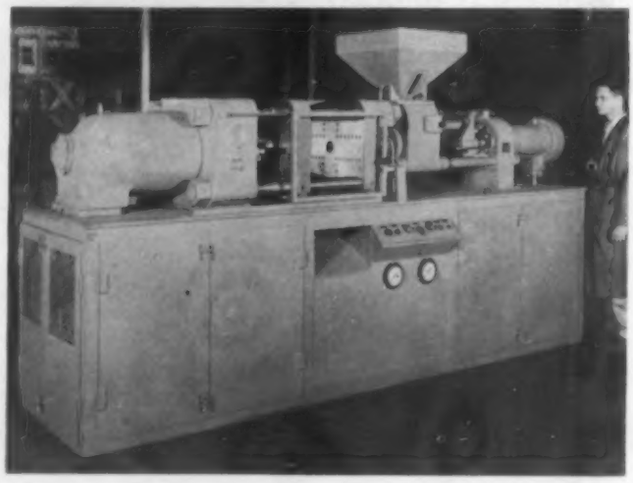
The headstock spindle has a speed range of 150 to 3000 r.p.m. in either the forward or reverse direction. The spindle takes standard 5C collets, providing a 1-in. round collet capacity through the spindle. Step chucks provide collet-like chucking of work up to 6 in. in diameter. By using two, three or four jaw chucks, odd shaped castings, stampings and forgings may be chucked.

The machine is supplied complete with welded pedestal and a tool storage compartment. Coolant facilities are an integral part of the pedestal base.

Universal drill jig and fixture—Matco Tool Co., 2830-36 W. Lake St., Chicago 12, Ill., has announced an all-purpose drill jig designed to eliminate costly fixtures and to reduce machine down time. Mounted on a 4 by 4 by $^1/_2$-in. removable base, this jig is $3^7/_8$ in. high. Using the thumb screw for a positive stop and the adjustable ground anvil for a locating base, holes ranging to $^5/_{16}$ in. in diameter can be accurately drilled and duplicated in stock up to $^3/_4$ in. in outside diameter. Cam action handle is used for quick locking. On the opposite V groove, material up to 1 in. in diameter can be accommodated. This multi-use machine tool is easily adapted to other needs. By detaching the base and laying it on the flat side, the accurate back V block makes it a perfect grinding fixture.

All-hydraulic 4-oz. plastics injection machine—The Hydraulic Press Mfg. Co., Mt. Gilead, Ohio, has introduced an all-hydraulic 4-oz. plastics injection machine, Model 125-H-4. Working pressure of 2250 p.s.i. is furnished.

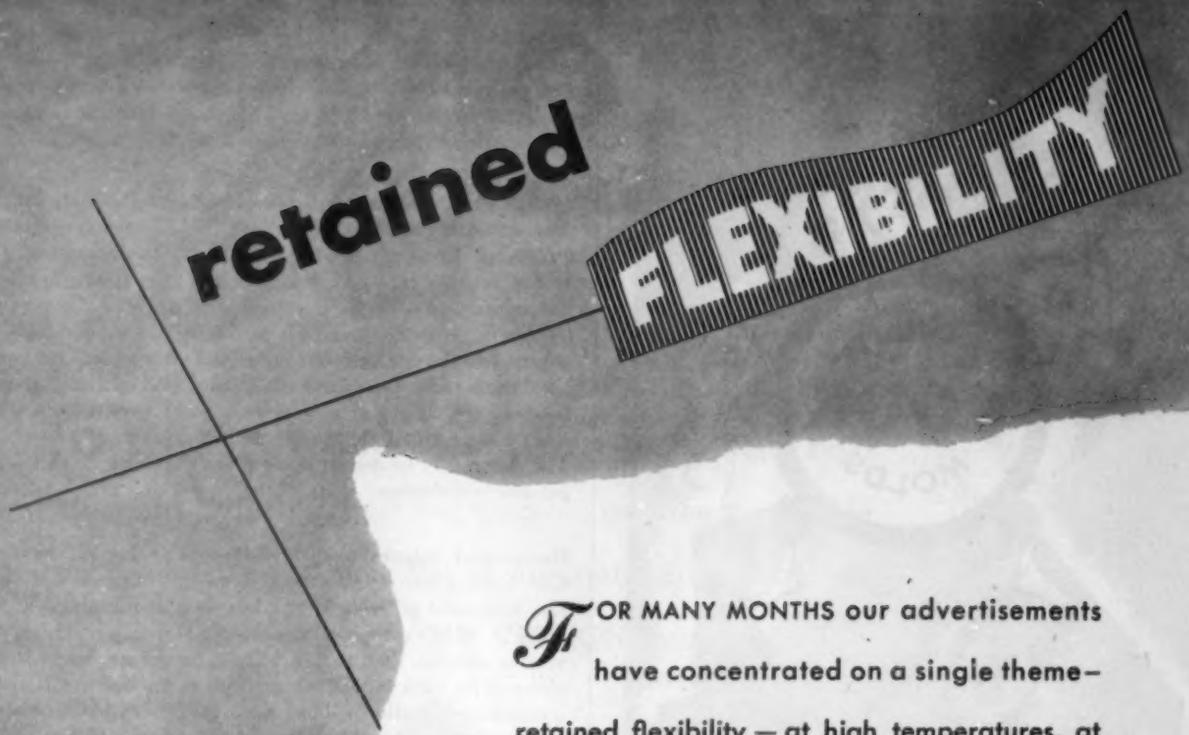
A new gravity feed system utilizes a lightweight, windowed sheet steel hopper of 50-lb. capacity hinged at base for access to



feed chamber and for ease of cleaning entire feed unit. Sprues and gates from moldings may be fed directly into chamber through opening adjacent to plunger. Feed mechanism is self-compensating.

An internal booster ram effects rapid mold closing while the main double-acting ram supplies live hydraulic pressure up to 125 tons for sealing the mold. The position of automatic shift-over of pressure from the booster ram to the main ram is adjustable and provides automatic slowdown of the mold clamp ram at predetermined position, eliminating die slam. The clamp ram closes at 530 in. per min. and opens at 355 in. per minute. Forward mold clamp travel is limited by a hydraulic by-pass arrangement which does away with need for stop collars on tie rods.

The movable die head is a solid steel plate which can be moved forward by two hydraulic cylinders for easy access to the heating chamber. This arrangement also permits the operator to inject material into the atmosphere without its entering the mold. The injection chamber is provided with a 3 kw. multiple zone heating system, using cast aluminum electric band heaters and indicating

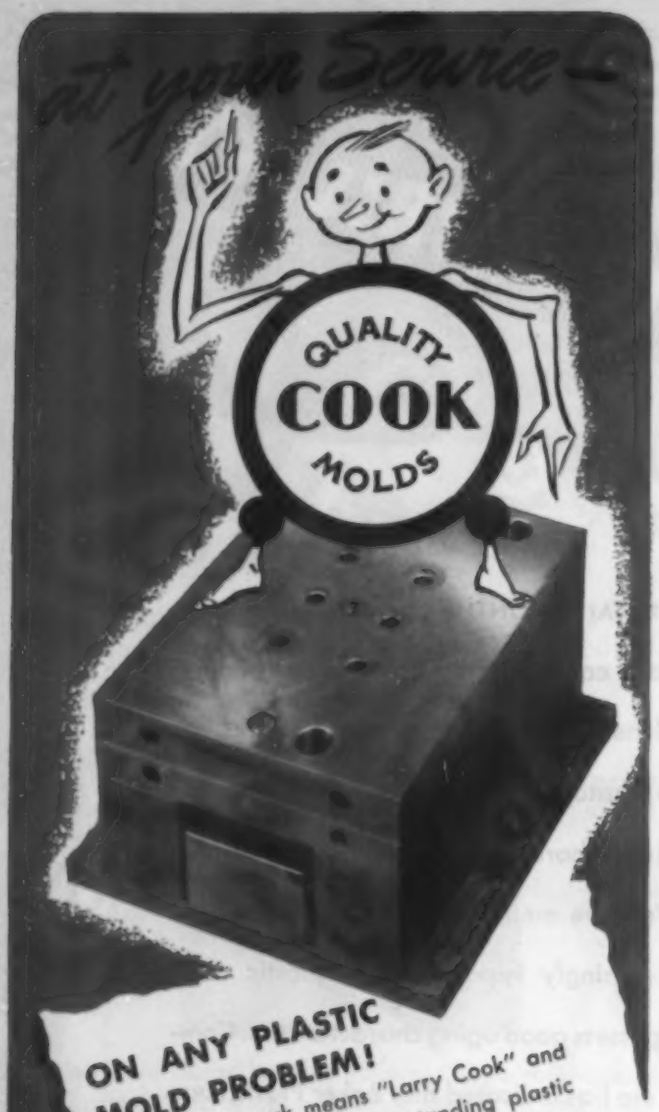


FOR MANY MONTHS our advertisements have concentrated on a single theme—retained flexibility—at high temperatures, at low temperatures: flexibility retained through exhaustive laboratory and outdoor exposure tests. We have emphasized this point because it is increasingly important that plastic compounds possess good aging characteristics. Commercial use has indicated that Baker Plasticizers have unusual ability to impart retained flexibility under extreme service conditions.

Our technical service staff is always available to help solve your plasticizer problems in the compounding of vinyls, rubber and celluloses.

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This trademark means "Larry Cook" and "Larry Cook" means outstanding plastic mold craftsmanship on every job "from hobs to harmonicas"!

Behind this trademark stands New England's most complete, small plastic mold shop . . . a shop of mold makers that thrives in making the hard ones look easy!

Get to know Cook service . . . get to know Cook results . . . prove for yourself what many manufacturers already know . . . that the place for any plastic mold problem is No. 65 Massasoit Avenue.

Why not call Larry for a consultation NOW?

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LAWRENCE H. COOK, INC.

65 MASSASOIT AVENUE

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temperature controls. Larger platen area will accommodate larger molds than heretofore. Vertical mounting between tie rods and utilization of the full vertical platen dimension permits use of molds up to 15½ by 21 inches. Horizontal mounting gives maximum mold dimensions of 12 by 24½ inches.

Melting and dipping equipment—Aeroil Products Co., Park Ave. at 57th St., West New York, N. J., announces two new groups of indirectly heated, insulated, thermostatically controlled melting tanks for use in heating, melting, dipping and pouring critical compounds such as wax, paraffin, oils, fats, pitch, hydroline, or battery, resistor and capacitor compounds. Constructed on the double boiler principle to insure uniform temperature, these tanks have built-in thermostatic controls which hold temperature rigidly at any desired point from 100 to 550° F. Both gas-fired and electrically heated equipment are available. The electrically heated equipment is available in both 40 and 15-gal. size installations.

Horizontal mixers and blenders—The H. W. North Co., Erie, Pa. has introduced several new types of single and multiple arm horizontal mixers and blenders suitable for mixing and processing a wide range of materials from dry powders to heavy viscous slurries and pastes. These machines are custom engineered for each individual application for batch, automatic or continuous operation. They are available in plain or stainless steel construction with mixing chambers jacketed when required for heating or cooling. Special designs for processing materials under vacuum or internal pressure have also been developed.

Heavy-duty contour sander—Sando-O-Flex Corp., 4373 Melrose Ave., Los Angeles 27, Calif., has designed Model 650C, a heavy duty contour sander for sanding and finishing operations, for stain finishing and for removing rust, scale, tool marks and for deglossing. The sander has a 6⅝-in. housing and 10¾-in. overall diameter. Abrasive strips are 2½ in. wide and refills come in various grits and grades, scored or unscored, in aluminum oxide and garnet cloth. It can be adapted to a flexible shaft, buffing and polishing lathe, electric motor shaft, drill press, woodworking or metalworking lathe or mandrel.

Resistance thermometer bulb—Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa., has announced a new type of industrial Thermohm which extends the range of resistance thermometer recorders and controllers to temperatures as high as 1000° F. This resistance thermometer bulb can be used for more exacting industrial requirements. Equipped with standard universal head, it can be installed in ovens, tanks, ducts or pipe lines. Standard lengths are 6 and 12 inches.

Stroke adjustment—An improved type stroke adjustment for regulating, while running, the volume of liquid pumped by a Milton Roy pump is announced by Milton Roy Co., 1398 E. Mermaid Ave., Philadelphia 13, Pa. This micro-indicating adjustment provides control of plunger stroke by means of a hand wheel. A vernier dial permits resetting to any predetermined stroke length, to within 1/750 of the full length of the full stroke without stopping the pump. These pumps are recommended especially for controlled volume pumping where it is desired to pump one or more liquids in precisely metered quantities, also for pumping in volumes as small as 1 pint per hour.

Motorized hydraulic injection molding press—Munton Mfg. Co., Franklin Park, Ill., has introduced a motorized hydraulic injection molding press which has a 3-oz. capacity and a mold sealing or clamping pressure of 50,000 pounds. Injection pressure is 12,000 p.s.i. This press has a heating cycle of 2½ oz. per min. without preheating, an operating cycle of 30 sec. and maximum opening for molds of 12 inches. All operations are performed with levers and treadles.

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News of the Industry

Bee-Kay Plastics Co., Box 93, Hill Station, Harrisburg, Pa., has been organized by Robert O. Bailey and Frank A. Keyser.

Maas & Waldstein Co., Newark, N. J., has developed a new line of enamels called Britelume that bake or air dry to a finish closely resembling brilliant aluminum. These enamels can be used on most metals to produce a finish which is very resistant to heat and chemicals.

Taylor Fibre Co., Norristown, Pa., has opened a West Coast plant located at La Verne, Calif.

Schwartz Chemical Co., 326–328 W. 70th St., New York City, has announced the addition, to their line, of Rez-N-Seal, a solvent type sealing agent designed specifically for use on all vinyl plastics. Free-flowing and water-thin, it can be applied with an eye dropper or a brush. It will not evaporate in open pan handling, fusing surfaces within 15 minutes. Neither the color nor the appearance of the material being sealed is said to be affected. Rez-N-Seal can be stored indefinitely and is recommended for pre-sealing before heat-sealing of polyvinyl chloride.

Steiner Mfg. Co., 100 Metropolitan Ave., Brooklyn 11, N. Y., has moved to its new location at 47–30 33rd St., Long Island City, N. Y. The new quarters are three times as large as the old and additional equipment has been installed.

The Nassau Die-Mold Co. of East Nassau, N. Y., was recently organized by F. W John and R. John to specialize in designing and building plastic molds, die-casting and punch press dies for the industry.

Acme Scientific Co., 1450 W. Randolph St., Chicago 7, Ill., is now offering a plastic mold polishing service for the removal of pits, scratches, waves, "lemon-peel" and tool marks. This service is said to produce blemish-free mirror finished mold surfaces. Chromium plating will be applied upon order. For optical lenses, the surface finish can be made as low as 0.2 to 0.5 micro-inch. Molds for external surfaces are finished to 1.5 to 4 micro-inches. Force plugs, plungers, etc., are finished appropriately for their function. Amount of stock removed is small, possibly 0.001 in. deeper than the deepest scratch.

The Dairy Products Div. of Hercules Powder Co., Wilmington, Del., has announced that domestic casein is now available for prompt delivery.

Manhattan Enterprise Co., 276 Newport St., Brooklyn, N. Y., has been organized and will manufacture products of supported and unsupported vinyl sheeting and from vinyl fabrics. A. B. Rose will handle sales, Morris Eilen production and Martin Weil office management.

The Division of Trade Standards, National Bureau of Standards, Washington, D. C., has sent out to producers, distributors and users of molded urea plastics, a proposed Commercial Standard for colors for molded urea plastics. It was submitted by the Plastics Materials Manufacturers Association. This Standard is designed to simplify and make more specific the exact color requested by molder or purchaser of goods; to reduce the number of rejections; to speed deliveries and simplify storage of color products. Adoption would not restrict production of other colors if the amount involved would warrant it. The Standard covers 17 colors, defines them in reproducible terms, specifies tolerances and provides for standard samples and designations to be used by materials manufacturers, molders and purchasers in specifying the colors desired. Producers, distributors and users are requested to indicate their acceptance or rejection of these proposed standards on blank being sent out with the Standards.

Tinnerman Products, Inc., Cleveland Ohio, has licensed **Shakeproof Inc., Div., of Illinois Tool Works,** Chicago, Ill., to manufacture and market Speed Nuts and Speed Clips—exclusive Tinnerman products. Classifications covered include U-type, J-type and Latching-type fasteners.

The Mathieson Alkali Works, Inc., 60 E. 42nd St., New York City, has leased the government ammonia plant at Lake Charles, La. About four months will be required to ready the plant for production.

Acme Backing Corp., Meadow & Bogart streets, Brooklyn 6, N. Y., has incorporated into its expanded Technical Dept. all activities and personnel of **Affiliated Research, Inc.,** formerly located at 239 E. 44th St., New York City.

Permalastic Products, 24305 Mound Rd., Centerline, Mich., has developed Viny-Lastic, a new adhesive for bonding vinyl sheet stock. The bond produced is said not to be deteriorated by vinyl plasticizers and not to require heat or pressure for bonding. It is designed to produce adhesion of vinyl to itself, metal, etc.

The Berg Plastics & Die Casting Co., Inc., with factory facilities in Meridan, Miss., has been organized and will specialize in injection and compression molding, die casting and wood working. Officers are as follows: Roy E. Berg, president; William M. Pepper, secretary; George Schneider, vice-president and treasurer; Joseph T. Mackey, George Pecaro, Kenneth M. Smith, Ralph R. Berg, directors.

Equipment in this plant which covers 75,000 sq. ft. will include a refrigeration plant for storage of perishable raw material plastics and air conditioning equipment. A laminating plant is being planned with high pressure press equipment for laminates of various types as well as for plywood. The plastics department will have a battery of 8 and 10-oz. injection molding machines, a group of 50, 150 and 300-ton hydraulic compression presses fitted with top rams arranged so that the presses can be used for straight or transfer molding. A group of fully automatic 50-ton presses are part of the thermosetting facilities.

Snyder Chemical Corp. has completed its first plant at Bethel, Conn., for manufacture of synthetic resins and plastics. This plant has an annual capacity of over 10,000,000 lb. of resins. Among the products to be manufactured are the Synco phenolic resins and emulsions of styrene and vinyl polymers. The resins are available for hot and cold-setting laminating and bonding adhesives, casting resins, molding materials, rigid and flexible impregnating and coating resins.

West Coast Plastics Distributors Co., 1400 E. Adams Blvd., Los Angeles, Calif., has been appointed West Coast representative for **M & N Machine Tool Works,** 144–146 Orono St., Clifton, N. J.

Paul Klemtner & Co., Inc., has moved to larger quarters at 790 Broad St., Newark 2, N. J.

Canadian Industries Limited, Montreal, Quebec, is planning a $150,000 expansion of its plastics plant at Brownsburg for the production of spun tapered and level monofilament for brush bristles.

Sorry!

On page 182 of the March issue, the name of the Plast-Loid Co. was misspelled. The firm has moved from 1186 Broadway, New York City, to new quarters at 129 Montague St., Brooklyn, N. Y.

(For additional news turn to next page)

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News of the industry

The Polytechnic Institute of Brooklyn, 87 Livingston St., Brooklyn, N. Y., is now offering for the first time a group option in plastic technology open to juniors and seniors in the Chemical Engineering Dept. It is designed for students wishing to enter the field of industrial plastics. The degree granted for the new program will be the usual Chemical Engineering diploma. Courses being taught during the current semester include "Plastic mold and product design" and "Technology of resins and plastics." A plastic technology laboratory course will be given as soon as a laboratory is completed at the Institute, while a course on organic chemistry of plastics is scheduled for this coming fall.

C-Thru Products Co., Inc., 307 14th Ave., Newark, N. J., has moved its general offices and production facilities to larger quarters at 270 Halsey St. where it will devote its facilities to the manufacture of Filteray screens.

National Research Corp., 100 Brookline Ave., Boston 15, Mass. has announced production of experimental quantities of silicon monoxide in granular form for hardening evaporated metal films on glass. A thin layer of silcon monoxide is evaporated onto the metal film by high vacuum evaporation techniques. Subsequent heating of this film converts it to silica, resulting in a surface which is said to have approximately 100 times the abrasion resistance of an unprotected metal film.

Chicopee Mfg. Co., 40 Worth St., New York City, has leased the former **Bona-Allen Co.** plant in Buford, Ga., to supplement screen and fabric production in the new Lumite plant at Cornelia, Ga. J. L. Hall, plant manager at Cornelia, has been transferred to the Buford plant as superintendent. Max Green has been appointed office manager and Loyce Moore plant engineer. The new plant provides about 35,000 sq. ft. of floor space.

Monsanto Chemical Co., St. Louis 4, Mo., has announced plans to construct manufacturing facilities for the production of polyvinyl chloride plastics at the company's Plastics Div., Springfield, Mass. The substance will be marketed under the name Polvin and will be produced in the form of elastic films and sheets, as colored and transparent rigid sheets, as extrusion compounds, molding compounds, calender compounds and polyvinyl chloride base resins.

Sintetica S. L., Bilbao, Spain, a private company, has been legally transformed into **Sintetica S. A.,** a public company with a share capital of 10,000,000 pesetas and with registered offices at Ribera 1, Bilbao. A factory is being erected at Azbarren-Bilbao in the province of Vizcaya for the transformation of synthetic resins by calendering, laminating, extrusion, injection and compression molding.

Phenoglaze Sales Corp., 315 Broadway, New York City, is now making Phenoglaze, a phenol-formaldehyde protective coating manufactured in England for use on all types of wood and metal products, available to fabricators in this country. Phenoglaze is applied by spray, brush or dipping. Its high resistance to galvanic influences, to acids and alkaline solutions, is said to make it a valuable finish in the manufacture of such products as furniture, station wagon bodies, wood or steel boats and radio cabinets. One feature is that it penetrates into wood and becomes an integral part of the surface. This plastic film is said to be impervious to heat, moisture and chemical action such as that of salt, gasoline, oil, alcohol, turpentine, acetone and other corrosive agents and to offer protection against termites, marine borers, cosmetics, cigarettes and contraction and expansion caused by temperature extremes. *(For personnel changes, turn to the next page)*



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If the operation of your equipment calls for the use of a hydraulic motor that can deliver better than 90 per cent torque efficiency in starting, it will pay you to get full information regarding this new Pesco Hydraulic Motor. Built to Pesco's high standards of technical excellence, it features in addition to its high starting torque efficiency, dual rotation, smooth operation, minimum parts and long life. It is non-stalling and exceptionally light in weight.

Its high starting torque efficiency makes it possible for this Pesco development to operate faster and more economically than conventional hydraulic motors. Its fewer parts mean minimum service requirements. Its light weight is a real advantage on any equipment on which it is installed. And, it provides a smooth, pulsation-free flow of power.

Built in sizes from 50 to 600 pounds inches torque, this motor will operate at working pressures up to 1500 p.s.i. and at operating speeds from 0 to 4000 r.p.m. For complete information regarding this, or other hydraulic power needs, write Dept. 47-W, PESCO PRODUCTS DIVISION, Borg-Warner Corporation, 16610 Euclid Avenue, Cleveland 6, Ohio.

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Personnel changes

Arthur L. Strasser has been elected chairman of the board of directors of Stein, Hall & Co., Inc., 285 Madison Ave., New York City, importers and manufacturers of industrial raw materials. Other officers are: **Edwin Stein,** president and director; **Morris S. Rosenthal,** executive vice-president and director; **Robert Rau,** treasurer, secretary and director; **Oliver H. Clapp, Cecil H. Coryat, Robert M. Stein, Robert Strasser,** vice-presidents and directors; **J. Rex Adams, J. Chesman Daly, Lawrence Gussman, Andre L. Picard,** vice-presidents; **George W. Brew, Donald V. Brandon, C. J. Dunachie, Miss Sadie Feldman, S. Hochberger, H. M. Johnston, W. W. Strasser, Jr., L. F. Turnbull,** assistant vice-presidents; **Alexander M. Doremus,** assistant treasurer; **Hannah Y. O'Neill,** assistant secretary; **Joseph M. Horine,** auditor.

Elmer C. Maywald, 11 S. LaSalle St., Chicago 3, Ill., has been appointed sub-agent for Dawson Associates of Leominster, Mass., who are in turn factory agents for Peri-Cast stainless steel molds and dies made by the Stainless Cavity Corp. of Leominster. Mr. Maywald's area will include the states of Michigan, Indiana, Illinois, Wisconsin and Iowa.

Frank T. Fletcher, general manager of the National Plastics Co. of Egypt (Societe Nationale de Matieres Plastiques) in Cairo, Egypt, was in New York City recently to procure equipment and raw materials—particularly phenolic, urea, thermoplastics for injection molding, papers and resins for laminating purposes.

The company was organized in April 1945 with a subscribed capital of 365,000£ or $1,460,000. As soon as necessary equipment is installed, the company will work with both thermoplastics and thermosetting materials and specialize in compression and injection molding, laminating, extrusion and fabrication.

According to Mr. Fletcher, the company hopes eventually to export plastics for industrial uses, novelties, toys and toilet goods such as combs and brushes. Contemplated markets include all of Africa and the Near East.

S. E. Hassan Nachat Pacha, ambassador to London from Egypt for 10 years, is president and chairman of the board of directors. Directors and vice-presidents are: **S. E. Elhamy Hussein Pacha, S. E. Mahmoud Choucri Pacha, S. E. El-Sayed Mohamed, Badraoui Pacha** and **M. Theodore P. Cozzika.**

We regret to announce the death of **W. F. Kaynor,** president and treasurer of Waterbury Companies, Inc., 835 S. Main Street, Waterbury, Conn., on Feb. 23.

C. R. MacBride has been appointed manager of the Plastics Products Div., E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del., to succeed **L. R. Blackhurst** who died Jan. 31 following a long illness. Mr. MacBride was formerly assistant manager of the division.

Dr. Jake T. Nolen has joined the staff of the Chemical Division Laboratory of the Plastics Dept. as a group leader. **Dr. John H. Blomquist** has been named research supervisor in the nylon section of the Rayon Technical Div.

John H. Schneider, former Army Air Force major, has joined the sales service staff of the Special Chemicals Div., Pennsylvania Salt Mfg. Co., Widener Bldg., Philadelphia, Pa.

Boyd R. Hopkins has been appointed sales manager of the Thermex Div., Girdler Corp., Louisville, Ky.

LeRoy T. Barnette, formerly branch office supervisor of the Cellulose Products Dept., Hercules Powder Co., Wilmington, Del., has been appointed manager of plastics markets of that de-

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partment. He will supervise the sales of all cellulose products to the plastics industry and will coordinate all technical service activities of the unit.

H. Arthur Howe has been named superintendent, **Clarence H. Slayton, Jr.,** engineering manager and **J. Rae Stirrat,** sales manager of the Compound Div., Chemical Dept. of General Electric Co., Pittsfield, Mass. **Nathan A. Freuden** has been appointed sales manager of the Plastics Div.

Russell R. Bradshaw, formerly with Dow Chemical Co., has been appointed vice-president and manager of the Roland P. Place Co., Midland, Mich., a Div. of the Trustees System Discount Corp.

W. F. Twombly has been appointed technical director of the Witco Chemical Co., 295 Madison Ave., New York City.

K. R. Troyer has been appointed sales manager of all divisions of the Columbia Machinery and Engineering Corp., Hamilton, Ohio, manufacturers of hydraulic compression plastic molding presses, phonograph record presses and special machinery.

M. J. "Marty" Barrett has been appointed assistant sales manager of Sandura Co., Inc., Philadelphia, Pa. **E. F. Selby** has been named advertising and sales promotion manager.

Gerald Stahl, designer, has moved his studio from 101 Park Ave., New York City to 12 E. 46th St.

Mark K. Pinkerman, formerly assistant advertising manager of Reichhold Chemicals, Inc., 601 Woodward Heights Blvd., Detroit 20, Mich., has been appointed advertising manager.

Francis J. Kennerley, treasurer, was elected to the board of directors of Hercules Powder Co., Wilmington, Del., at a recent directors' meeting.

Edward Broderick has joined Kenilworth Molding Co., 8 Renee Place, Irvington 11, N. J., as plant superintendent.

L. M. Morley has been elected a vice-president of the Minneapolis-Honeywell Regulator Co., 2753 Fourth Ave., Minneapolis, Minn. He will continue as vice-president in charge of sales for the Brown Co., a subsidiary.

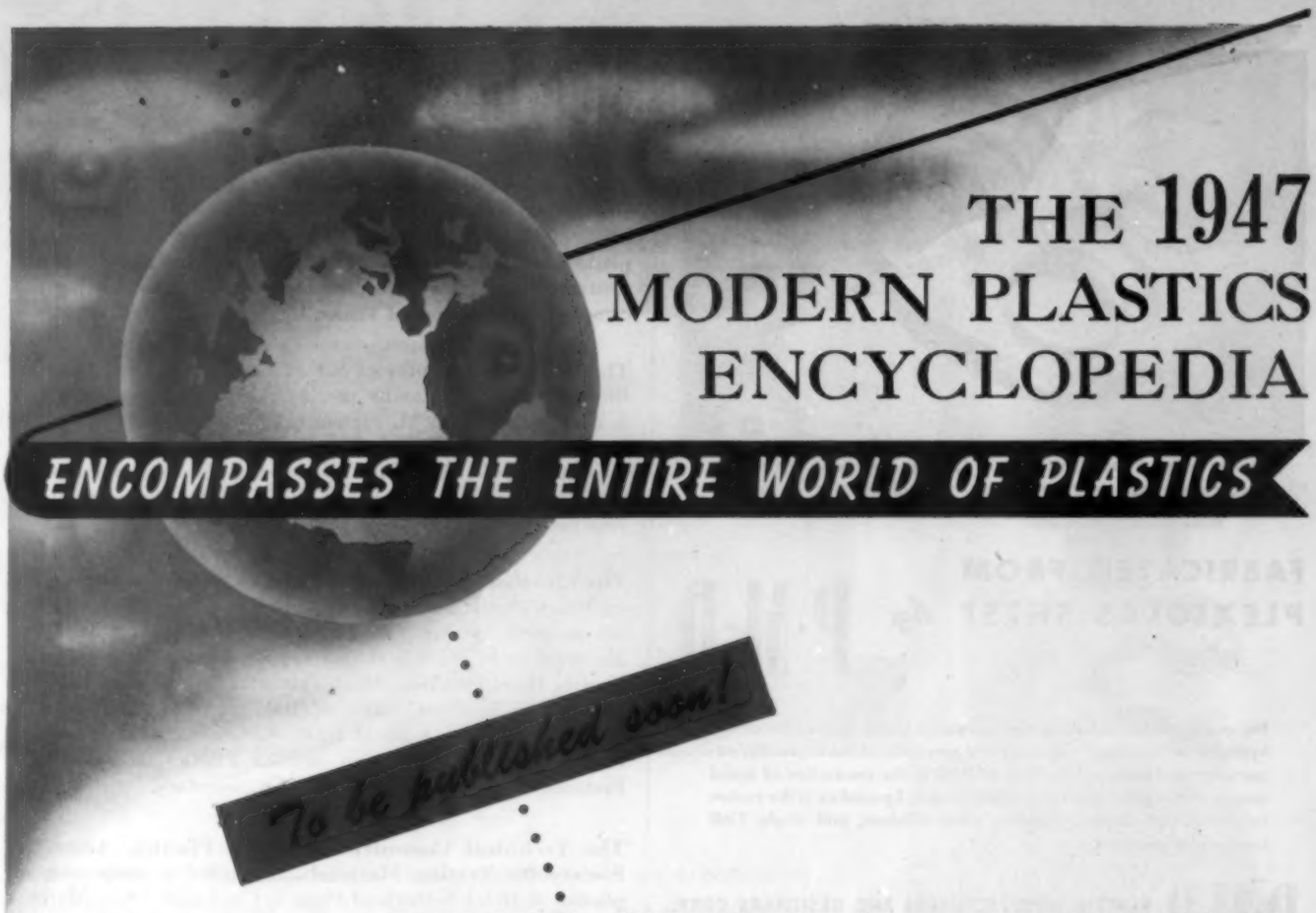
Joseph F. Zemaitis, formerly with the U. S. Rubber Co., and Dispersions Process, Inc., has been appointed vice-president and technical director of Burlington Mills, Inc., Burlington, Wis.

Joseph De Varco, has been appointed advertising and sales manager of Rogers Plastic Corp., North Wilbraham, Mass. **John Sayles,** formerly associated with McCoy Jones & Co. and Chicago Molded Products Corp., has joined the company as sales engineer.

Edmond J. McSweeney has been elected vice-president in charge of manufacturing of The Hydraulic Press Manufacturing Co., Mt. Gilead, Ohio.

C. P. Joslyn has been appointed general manager of the Chemical Products Division of the Goodyear Tire and Rubber Co., Inc., 1144 E. Market St., Akron, Ohio.

We regret to announce the death of **Dr. Lawrence Vincent Redman,** internationally known for his contributions to plastics, who died Nov. 25 while visiting at the home of a friend in Toronto, Canada. *(Please turn to the next page)*



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Meetings

The Plastics Engineers Association met March 17 at the Yale Club, New York City, and heard Fred B. Stanley, engineering editor of MODERN PLASTICS, talk on "Some new developments in plastics molding equipment". William L. Searles of Tennessee Eastman Corp. gave an explanatory talk prior to showing the company's film, "Story of Tenite."

The St. Louis Chapter of S.P.E. has elected Todd Clark of Burkhart Mfg. Co., as its new president. Other officers are: J. Maver Feehan, J. M. Feehan Co., vice-president; Alvin W. Brust, professor at Washington University, secretary-treasurer; Kenneth Craver, Monsanto Chemical Co. and George Krieger of S. K. M. Engineering Co. and Koller Craft Co., members of advisory committee.

The Cleveland Section of S.P.E. met at the Cleveland Club on March 28 and had Julian C. Kazimier of Amos Molded Plastics as guest speaker. W. H. Kemper of Carpenter Steel Co. discussed mold steels and their applications at a meeting at Youngs Hotel in Akron, Ohio, Feb. 21. New officers for 1947 are: Paul L. Reed, editor of Industrial Plastics Magazine, president; M. Scott Moulton, B. F. Goodrich Chemical Co.; Frank Ackerman, Ackerman Molded Plastics, treasurer and Francis C. Hayes, Chemical Rubber Co., secretary.

The Technical Committee D-20 on Plastics, American Society for Testing Materials, conducted a symposium on plastics at Hotel Netherland Plaza in Cincinnati, Ohio, March 4 and 5. Speakers and their subjects for the March 4 session included: G. M. Kline and F. W. Reinhart, National Bureau of Standards, permanence of plastics; M. M. Braidech, National Board of Fire Underwriters, flammability of plastics; A. J. Warner, Federal Telecommunications Laboratories, electrical properties of plastics; J. Leutritz, Jr., Bell Telephone Laboratories, Inc., the effects of fungus and moisture on plastics.

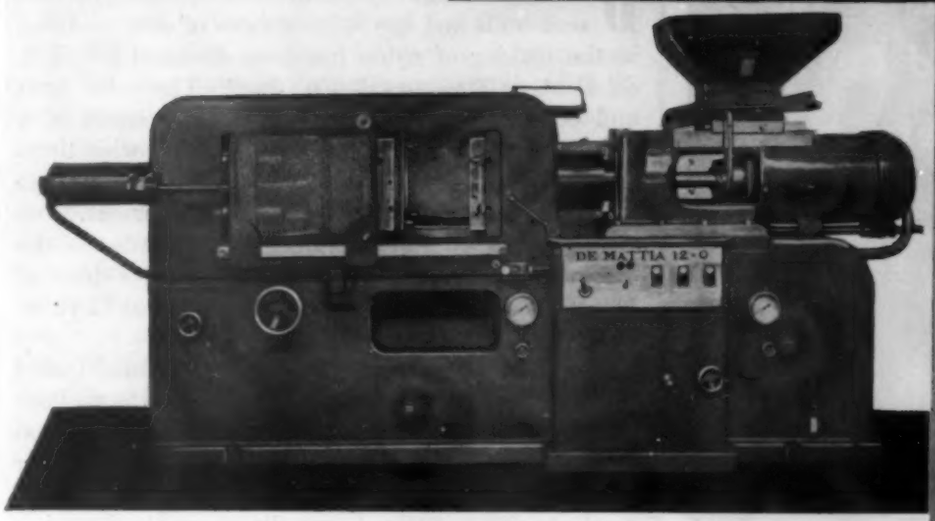
Speakers and their subjects for the March 5 session included: T. W. Noble, Fabricon Products Corp., low pressure phenolic laminates; J. K. Graver, Monsanto Chemical Co., the mechanism of plasticization in plastics; H. R. Moulton, American Optical Co., use of plastic materials in optics; R. G. Chollar, National Cash Register Co., metal-plastic applications and J. D. Ryan, Libbey-Owens Ford Glass Co., automotive glazing with plastics. The Symposium Committee consisted of A. W. Downes, Jr., chairman; C. J. Frosch and W. C. Goggin.

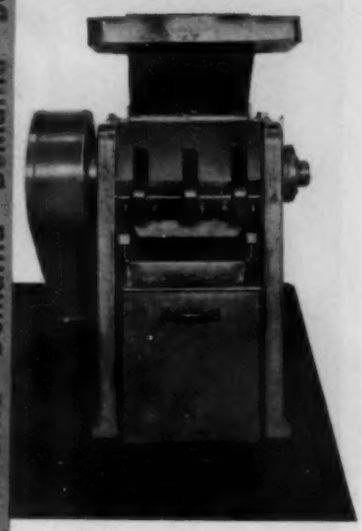
Dow Chemical Co. showed two motion pictures—the new Walt Disney color film, "Treasure from the sea" and "This is magnesium"—at the convention of the National Education Association at Atlantic City, N. J., March 1–6.

The second Foundation Lecture of the Institution of the Rubber Industry will be held June 6 in the Grand Hall of the Connaught Rooms, Great Queen Street, W.C., London. Dr. Philip Schidrowitz, F.C.S., F.I.R.I., Colwyn medallist for 1940, will speak on "The impact of synthesis on the rubber industry." Dr. Schidrowitz's talk will cover plastics and other relevant materials. Overseas visitors may get tickets and additional information by writing to the Secretary, I.R.I., 12, Whitehall, London, S.W.1., England

The Philadelphia Section of S.P.E. met at Franklin Institute Feb. 17. George W. Clark of the Owens-Illinois Glass Co. spoke on molding powders and bottle closures while R. V. Beshgetoor led a discussion of technical papers presented at the recent national S.P.E. convention.

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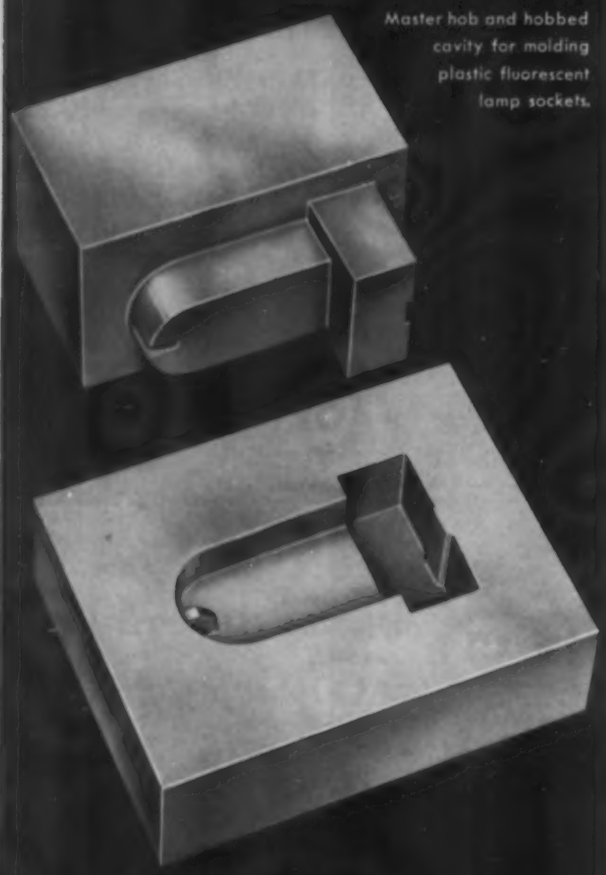
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Nylon to be made

DEVELOPMENT of a chemical process to use such agricultural by-products as corncobs, cottonseed hulls and the hulls or bran of oats and rice in the making of nylon has been disclosed by E. I. du Pont de Nemours & Co., Inc.[1] The cobs, hulls and other cellulosic materials are the sources of a chemical known as furfural. The new process turns furfural into adiponitrile, a chemical important in making nylon. It is said that this development, from the first small-scale laboratory experiments to the large semi-works units which can produce tons of adiponitrile from furfural, cost du Pont about 12 years' time and approximately $1,000,000.

The Quaker Oats Co. will supply the furfural needed for this new adiponitrile process as soon as the du Pont Niagara Falls plant, to be constructed, begins operation. The Quaker Oats Co. estimates that over 100,000 tons or 200,000,000 lb. of agricultural by-products will be utilized annually to supply the maximum amount of furfural the du Pont Co. might need for this process.

Sources of raw materials

Nylon is now derived from the components of coal, air and water. But, between the starting materials and the finished product, there are long, complicated and expensive chemical and manufacturing processes. Du Pont research men have found that natural gas and petroleum also provide basic raw materials. The new process is a further step in diversification of sources of nylon intermediates.

Constant technical improvement of the present nylon processes has made it possible to reduce the price of nylon several times in the past seven years. However, it is emphasized that the use of agricultural by-products, as a starting material, will not necessarily bring a reduction of manufacturing costs anytime in the near future.

Advantages of furfural

As a raw material for chemical processes, furfural possesses many attractive features. It is available in essentially unlimited quantities, and, unlike raw materials derived from natural gas, petroleum or coal, is "grown" each year, so that no depletion of furfural sources need be feared.

Furfural has been used in chemical processes for 25 years, but it is little known to the layman. It is a tan-colored liquid with a faint bitter-almond odor. A rare chemical 30 years ago, it is now used in refining petroleum lubricants, butadiene for synthetic rubber, wood rosin and vegetable oils.

Furfural is manufactured largely from corncobs

[1] Paper presented by Dr. O. W. Cass of Electrochemicals Dept. at Twelfth Annual Chemurgic Conference of Agriculture, Industry & Science at Oklahoma City, Okla., on March 27, 1947.

from furfural

today. On thousands of farms, the cobs are mainly a nuisance after the shelled corn is shipped. They are a fire hazard in the barnyard and a detriment to the soil. While a few are used for fuel in farming communities, they burn very quickly and, compared to the total quantity of cobs produced annually, the amount used as fuel is infinitesimal.

Today many millions of pounds of furfural are required in industry and the price has dropped to below 10 cents per pound, compared to $2.50 per pound when it was first marketed. But even the greatly increased production will take but a tiny fraction of the corncobs produced annually. Furfural is also made from the hulls of oats, rice and cottonseed, peanut shells, flax shives and bagasse, so that the raw materials for this important chemical are nation-wide.

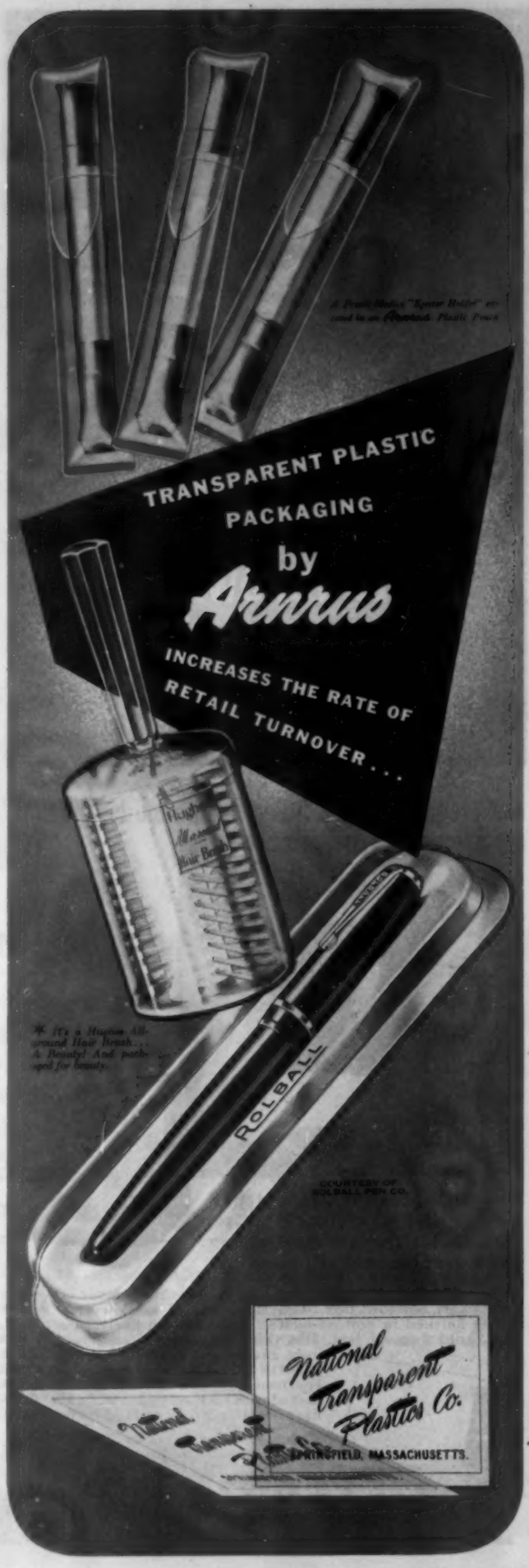
Processing of furfural

The process which has been developed for the manufacture of adiponitrile from furfural is an excellent example of the intricacies of modern industrial organic chemistry, involving, as it does, the carrying out of four successive complicated organic reactions under carefully controlled conditions to give high yields of the desired product.

The process may be outlined as follows: Furfural is catalytically decomposed to form the fine-atom ring compound furan, which is hydrogenated to the saturated cyclic ether tetrahydro-furan. This compound is reacted with hydrogen chloride to yield 1,4-dichlorobutane, which is converted to adiponitrile by reaction with sodium cyanide. Adiponitrile is then hydrogenated to hexamethylene diamine. Hexamethylene diamine and adipic acid combine to form nylon salt, which, upon processing, yields the nylon fiber of commerce.

The manufacture of furan from furfural is the first step in this new route to the nylon intermediate, adiponitrile. The manufacturing process involves the catalytic removal of the aldehyde side chain from furfural as carbon monoxide. The reaction is carried out at 400° C. over a catalyst consisting of a mixed chromite of zinc and either manganese or iron.[2] The furfural is vaporized and mixed with steam before passage over this catalyst. The carbon monoxide which is released by decomposition of the furfural reacts with the steam present to form carbon dioxide and hydrogen. Furan, unconverted furfural and water are condensed from the gas mixture passing from the catalyst chamber, leaving a mixture of equal volumes hydrogen and carbon dioxide as the uncondensed gaseous product of the reaction. The conversion of furfural to furan is nearly complete and the

[2] U. S. Patent 2,374,149.



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yield of furan is high. After some hours' operation, the catalyst requires reactivation. This is readily carried out by diverting the furfural and steam to a second reactor and reactivating the spent catalyst with a stream of air which is followed by a short reduction with hydrogen.

The second step in the new furfural to adiponitrile process is the hydrogenation of furan to tetrahydrofuran. This process may be carried out either batchwise or continuously, in the presence of suitable catalysts.[3] The yield of tetrahydrofuran is nearly theoretical.

The third step involves reaction of tetrahydrofuran with hydrogen chloride to form 1,4-dichlorobutane. This reaction may be carried out in a number of ways. If desired, tetrahydrofuran, hydrogen chloride and water, may be heated under pressure at elevated temperatures with or without catalytic materials. Hydrogen chloride may also be reacted with tetrahydrofuran at atmospheric pressure in the presence of dehydrating agents such as zinc chloride or sulfuric acid, to give good yields of the dichloride.[4]

Still a third method of carrying out this reaction involves the use of amine hydrochlorides as catalysts for the reaction. In all of the above methods of converting tetrahydrofuran to 1,4-dichlorobutane, the yields of the dichloride are nearly theoretical.

The fourth step involves the conversion of 1,4-dichlorobutane to adiponitrile. This is carried out by reaction of the 1,4-dichloride with sodium cyanide in the presence of an appropriate solvent. The sodium chloride which is formed is insoluble in the reaction mixture; it is removed by filtration and the solvent and adiponitrile are then separated by fractional distillation. Yields on this step also are high.

The hydrogenation of adiponitrile to hexamethylene diamine, reaction of this with adipic acid and further processing of the product to nylon, are carried out by means of established industrial practice. Adiponitrile can also be hydrolyzed to adipic acid, the other main intermediate in the process for nylon. However, the present installed facilities for the production of adipic acid from benzene and not from furfural, will continue to be used.

New furfural chemicals

A result of this new method of manufacture for nylon from furfural will be the availability of the three chemical intermediates—furan, tetrahydrofuran and 1,4-dichlorobutane—for other uses. Delta-chlorovaleronitrile can also be made available by a slight change in operating procedure. The Electrochemicals Department of the du Pont Co. has explored extensively other new synthetic organic chemicals which are derived from furfural.

Although these new furfural chemicals have been subjected to only preliminary evaluation, a number of applications can be mentioned. Tetrahydrofuran and tetrahydropyran are extremely active solvents for a

[3] U. S. Patent 1,006,873.
[4] U. S. Patent 2,218,018.

wide variety of natural and synthetic products. For example, both vinyl chloride and vinylidene chloride type resins are highly soluble in either of these materials, while the moderate boiling points of the compounds (66° and 88° C., respectively) make their use as film-casting solvents for the chlorovinyl resins most attractive.

Furan, methyl furan, tetrahydrofuran and dihydropyran may be polymerized under a wide variety of conditions to yield polymers which have an extensive range of properties.

The greatest potential use of these compounds is, however, as chemical intermediates for the preparation of 4 and 5 carbon atom chains with a wide variety of reactive groups at each end. These compounds appear quite promising for the synthesis of pharmaceuticals, vitamins, plasticizers and for various condensation products.

Plastics Products Addresses

(mentioned on pages 114 through 117)

American Injection Molders, Inc., 42-38, 40 27th St., Long Island City, N. Y.

American Junior Aircraft Co., Portland, Oregon

Artlee Products Co., 251 W. 40th St., New York City

Art Plastics Mfg. Co., 212 W. Third St., Los Angeles 12, Calif.

Constance Bennett Cosmetic Co.,1775 Broadway, New York City

California Moulders, Inc., 814 E. 29th St., Los Angeles 11, Calif.

Davis Plastics, Jersey City, N. J.

Empire Brush Works, Port Chester, N. Y.

Evans Case Co., North Attleboro, Mass.

General American Transportation Corp., 135 S. LaSalle St., Chicago, Ill.

McDonald Mfg. Co., New Baltimore, Mich.

Remler Co., Ltd., 2101 Bryant St., San Francisco 10, Calif.

Shaw Insulator Co., 160 Coit St., Irvington, N. J.

Mrs. Stevens Candy Shops, 611 N. Sacramento St., Chicago, Ill.

Tri-Pak Gun Kit, Inc., 60 Brady St., San Francisco, Calif.

Stock Mold Addresses

(mentioned on page 166)

1735–36 Kilgore Mfg. Co., Westerville, Ohio

1737 Eastern Plastics, Inc., 437 Union Trust Bldg., Pittsburgh 19, Pa.

1738 Tupper Plastics Co., Farnumsville, Mass.

1739 Eastern Plastics, Inc., 437 Union Trust Bldg., Pittsburgh 19, Pa.

1740–42 Kilgore Mfg. Co., Westerville, Ohio



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Despite apparent tapering, these urea beakers have no undercut. Mold was consciously designed for this effect

Urea tableware

ATTRACTIVE examples of the tableware being molded in England—a cruet set and drinking tumblers ("beakers" as they say in England)—are shown here. These are economically priced items which, already having been used before the war, have recently been redesigned for postwar use. Molding of all the pieces is done by Streetly Mfg. Co., Ltd., Streetly, Birmingham, England.

The four piece cruet set—salt and pepper shakers, mustard bowl, and sugar shaker—is molded of Beetle. The plastic material was chosen not only because of its availability but because the material withstands hard wear, is smooth and pleasant to the touch, can be easily sterilized and has great color appeal. This set comes in a range of twelve colors.

Tumblers, made in varying sizes, are also molded of Beetle. It is interesting to note the optical illusion given by the shape of the tumblers, mak ng them appear to be tapered in at the bottom and at the top circumferences. Actually there is no undercut in the tumbler at all. And, as can be seen when placing the tumbler against a straight edged object, the apparent middle bulge will clear the object. This optical illusion was not an accident, however, but was a conscientiously strived-for effect in design.

A new cruet set molded in urea shows results of redesigning a prewar line. The 4-piece set comes in 12 colors



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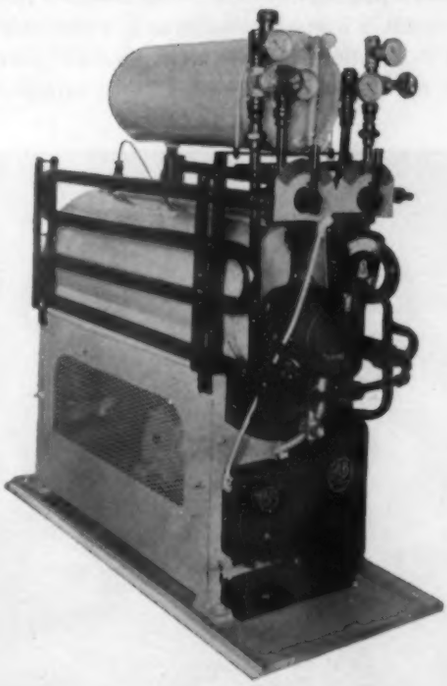
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Stripping threaded molded closures

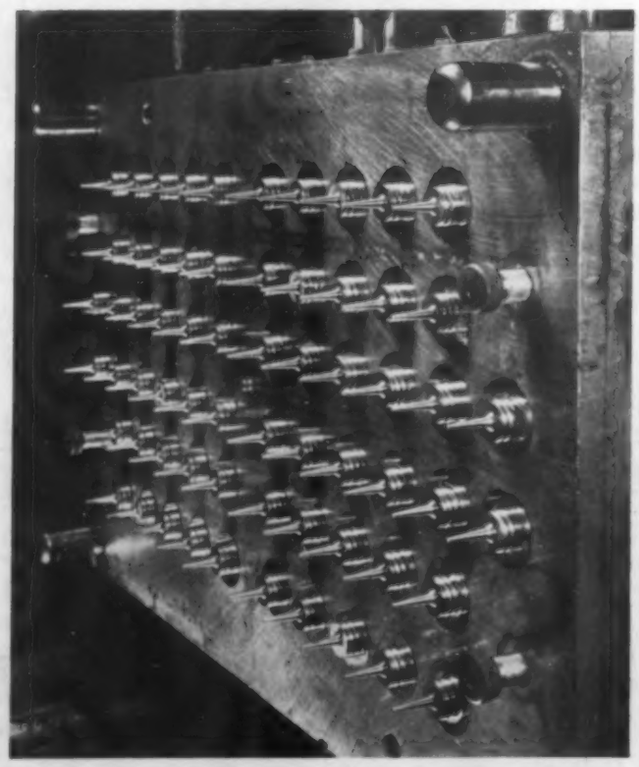
THERE is more in the design of a threaded plastic bottle or can closure than meets the eye. Each closure presents the mold designer and the tool maker with a number of problems that must be solved prior to production.

Solution depends on design

First, the client will probably specify the type of closure, or send a model to be followed. If the thread on the model has numerous full turns the molding must be solved in one way. If it has only one or two turns, another solution is possible.

In the case of numerous full turns to the thread the molded closure will have to be unscrewed from the mold. This can be done *in situ* with complicated automatic unscrewing devices or it can be done on the bench by

The closures turned out in this 64-cavity mold are threaded. Since the molding material employed is a thermoplastic, the mold was designed so the finished parts are pushed off the threaded force plugs by a stripper plate

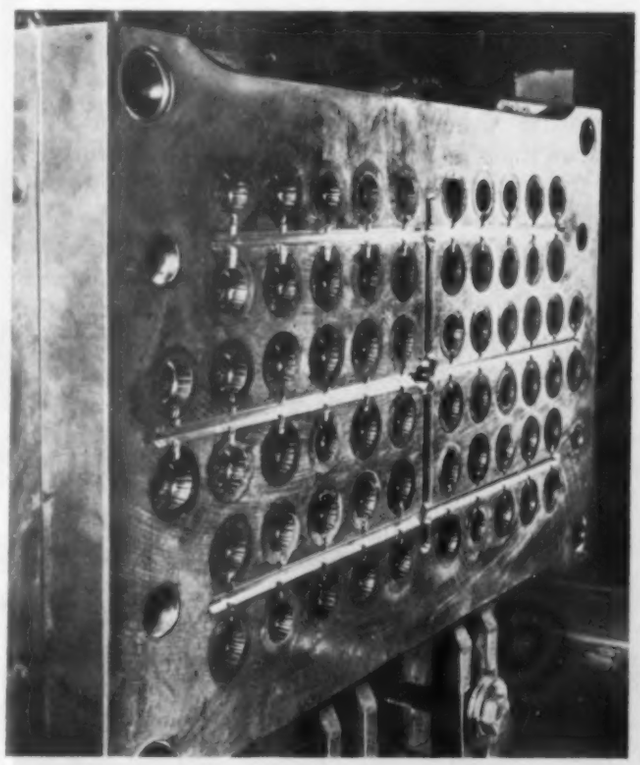


When a closure has no more than two and one-half turns in a thread, it is possible to detach the molded closure from the force plug by the single operation of a stripper plate

means of a left-hand electric screw driver fitted with a special chuck. The bench method involves the use of two force plates, if the rate of molding is to be maintained. While the closures are being taken off one set of force plugs, the empty set is inserted in the press by the operator..

In contrast, where the client demands only two or two and a half turns in the thread, the molded closure can be safely detached from the force plug by the operation of a stripper plate in the press. The stripper plate is set in the mold in such a way as to grip the neck of each force plug and at the same time to form an integral part of the force, coming into direct contact with the thermoplastic material. The front face of the stripper plate actually molds the flat rim at the base of the closure. (*Please turn to next page*)

This view of the cavity half of the 64-cavity mold for the production of thermoplastic closures shows runners and gates which insure the complete flow of material even in the cavities that are fartherest from the sprue



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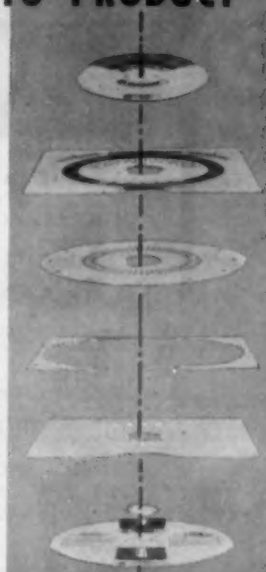
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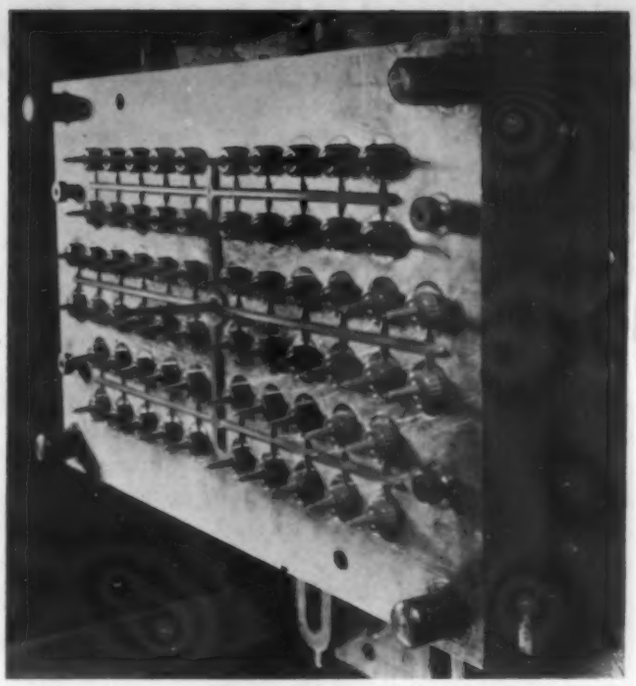
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With the mold partially open after material has been injected, the stripper plate does not operate. To strip the parts, the force plate must be retracted still further in order to pull the force plugs out of molded parts

When the mold is opened, the stripper plate is drawn back with the force plugs but the bars fixed to the back of the plate come into contact with fixed stops or buffers, so that the plate comes to a standstill though the force plugs continue to slide back. The effect of this is to lift the closure off the force plugs since the rims of the closures are in contact with the front face of the stripper plate itself.

Operation of stripper plate

At first sight, when watching this operation, it appears that the stripper plate pushes the closures off the force plugs, but in fact all the stripper plate does is to hold the closures still, shortly after the mold opens, while the force plugs continue to retract. The plugs then snap out of the closures, without damaging the molded threads. This is possible because at that stage the thermoplastic material is still warm and pliable enough to take the momentary expansion necessary for the molded threads to disengage from the master thread on the force plugs. The plastic reverts at once to its original dimensions as soon as it is clear of the force plugs. This method speeds the molding cycle to the extent that it takes no longer to mold a threaded closure than it does to mold one which is unthreaded.

But the design problem does not end there. The profile of the thread must be suitable to this "snap off" operation. A sharp V cut thread will not strip off without fracture or distortion. It must be remembered, however, that stripping can be done only with



This view of the mold shows the force plug half out of the mold with stripper plate in its operating position. Note that the large diameter threaded portion of force plugs are retracted into the bushings of stripper plate

the rolled type of thread such as those normally found on metal cans.

Oil can closure

A good example of the use of the stripper plate is a job currently being done by Majestic Molded Products, Inc., Long Island City, N. Y., on cellulose acetate closures for the "3 and 1 Oil Cans" of the Boyle Midway Co., a Division of American Home Products. The closure has two and a half rolled thread turns. The mold has 64 cavities. The complete molding cycle, including stripping of the closures from the force, takes 34 seconds. This is perhaps the largest thermoplastic stripping operation, from the point of view of number of cavities involved, yet attempted.

There are two other features of interest in this mold design. The closure is capped with a conical spout, about $^{3}/_{4}$ in. long with a top included angle of 9°. The original specification called for a top angle of 6° but this had to be increased to 9° for fear of damage to and bending of the tapering force plug. The top of this spout is finished with a thin plastic lug or tip to be broken off by the end-user to allow the oil to pour or drip from the can.

A point that had to be watched in making this mold was the question of air-venting that portion of the mold cavity that molds the conical spout. This was done by drilling a fine hole at the back of the cavity block, in line with the tip of the cone and inserting in that hole a piece of fine piano wire. The wire was round in section but one side was slightly flattened to allow

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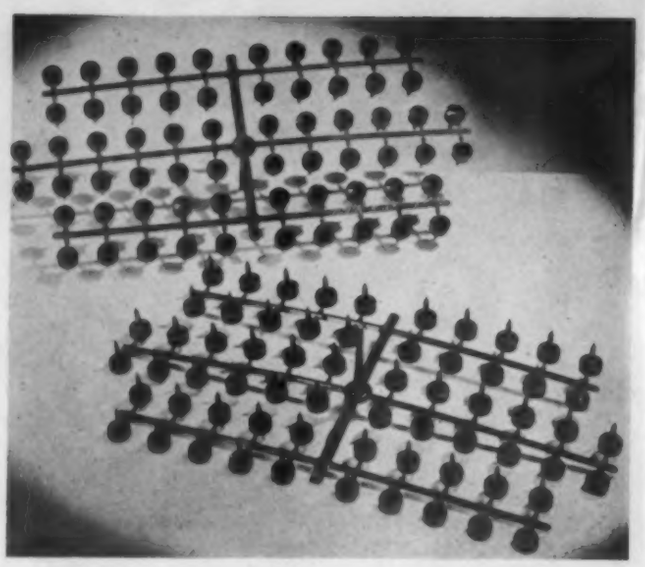
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These closures for an oil can are the product of the 64-cavity mold pictured elsewhere in this article. They are typical of type of closure that can be removed from a mold by stripping rather than unscrewing action

an infinitesimal escape of air from the conical cavity. This air passage is too small to accept any plastic material, even at its most fluid state.

Making oil can closure mold

The tool-maker on this job was faced with two choices. He could either machine the cavity or hob it. Machining and polishing of the long, narrow spout would have been an expensive and ticklish job. Hobbing was the alternative but it was found that two hobbing operations were necessary for a cavity of this form. The first hob made the large diameter depression for the threaded part of the cap and opened up the way to the deeper depression for the conical spout. That much was done with one squeeze. A conical, tapered hob completed the cavity with a second squeeze. The small chamber for the plastic break-off tip at the end of the spout was too small for hobbing and was therefore machined.

Under pressure from the client, the mold designer—Mr. Howard C. Carter, Chief Engineer of Majestic Molded Products, Inc.—completed the design and the working drawings for this difficult mold, with its 64 cavities and stripper plate, in three days. The mold maker completed his part of the work in under eight weeks, so that eight weeks from the word *Go* the closure was in production.

Production rate

The company is molding 180,000 of these closures every 24 hours. No finishing operations on the molded product are required. The gates being very thin—only $^{1}/_{16}$ in. across and $^{20}/_{1000}$ in. thick—the operator can strip the closures off the sprue with one sweep of a gloved hand. The press used for this mold is a 12-oz. horizontal Watson-Stillman.



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Production

THESE statistics represent the shipments and consumption of plastics and synthetic resins as reported by 79 manufacturing companies and company departments. Data for synthetic resins for protective coatings are not included. Shipments, for the purpose of this report, include data for plastics and resins which are manufactured by the reporting companies or company divisions and shipped to outside users. Consumption refers to the quantities of plastics

PLASTICS AND SYNTHETIC RESIN PRODUCTION
From Statistics Compiled by Bureau of

Materials
Cellulose acetate and mixed ester plastics[a]
Sheets
Continuous (under 0.003 gage)
Continuous (0.003 gage and upward)
All other sheets, rods and tubes
Molding and extrusion materials
Total
Nitrocellulose plastics[a]
Sheets
Rods and tubes
Total
Other cellulose plastics[b]
Phenolic and other tar acid resins
Laminating (dry basis)
Adhesives (dry basis)
Molding materials[c]
All other, including casting (dry basis)[c]
Total
Urea and melamine resins
Adhesives (dry basis)
Textile and paper treating (dry basis)
All other, including laminating (dry basis)[c,d]
Total
Polystyrene[e]
Vinyl resins
Sheeting and film, including safety glass sheeting[a]
Textile and paper coating resins (resin content)
Molding and extrusion materials (resin content)
All other, including adhesives (resin content)[c]
Total
Miscellaneous plastics and resins
Molding materials[a,g]
All other (dry basis)[c,h]
Total
Grand Total

[a] Includes fillers, plasticizers and extenders. [b] Includes methyl and ethyl cellulose and related plastics. For comparable figures for January-June 1946, see footnote 2 in August "Facts for Industry," Series M 19H-86. [c] Excludes data for protective coating resins. [d] Urea and melamine molding materials included with miscellaneous molding materials. [e] Dry basis, including necessary coloring material. / Revised. The revisions were occasioned by classi-

of plastics

and resins which are manufactured and used by the reporting companies or company divisions. Statistics are available beginning June 1945. Data for cellulose plastic products only are available for earlier periods. Readers should note that this report varies from the annual Tariff Commission study, which covers all synthetic resins. It is also interesting to note the changes which have been made in production figures of certain materials for the month of December 1946.

IN POUNDS FOR 1946, DEC. 1946 AND JAN. 1947
Census, Industry Division, Chemical Unit

Total for 1946	*December 1946*	*January 1947*
7,649,795	670,574	816,954
7,498,529	652,588	636,257
4,717,401	367,587	467,128
83,204,045[r]	7,951,037[r]	7,656,594
103,069,770[r]	9,641,786[r]	9,576,933
10,932,131	937,160	1,051,751
7,228,862	569,276	545,121
18,160,993	1,506,436	1,596,872
12,183,113[r]	888,774[r]	584,683
27,606,337	3,120,980	3,873,912
15,664,701	1,614,113	1,540,734
140,216,443	10,579,844	14,736,607
57,860,624	5,185,017	6,814,636
241,348,105	20,499,954	26,965,889
40,793,112	3,911,830	3,624,026
13,534,368	976,008	1,510,363
3,746,580	880,266	882,654
58,074,060	5,768,104	6,017,043
66,791,843	8,091,951	7,410,973
24,551,165[r]	4,770,453[r]	6,196,557
24,429,379[r]	1,112,495[r]	1,237,297
63,591,267	6,243,440	6,801,822
27,440,424	3,260,779	3,096,480
140,012,235[r]	15,387,167[r]	17,332,156
54,033,807	4,666,059	5,631,342
35,705,946[r]	2,876,504[r]	2,532,674
89,739,753[r]	7,542,563[r]	8,164,016
729,379,872[r]	69,326,735[r]	77,648,565

fying as sheeting and film material previously classified as textile and paper resin. Revised figures for earlier months will be shown in a forthcoming release in this series. [g] Includes data for urea and melamine, acrylic acid and miscellaneous molding materials. See footnote 9, Series M 19H-86. [h] Includes data for petroleum resins, acrylic acid ester resins, mixtures and miscellaneous synthetic materials. [r] Revised.



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Spools for holding fishing lines are molded of Tenite by American Molding Co. for Sunset Line & Twine Co., both of San Francisco, Calif. A molded-in interior compartment gives spool additional carrying capacity.

Compartmented fly boxes are injection molded of Lustron by Vlchek Tool Co., Cleveland, Ohio. The boxes, made in three sizes, provide an excellent means of carrying and protecting flies which remain visible.



Transparent fly boxes are popular with all fishermen. The molded spool for the holding of fishing lines also has its place in every fisherman's tackle box



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THE false uppers and lowers for stuffed bears and members of the cat family are being molded by C. M. Moore Co., Kansas City, Mo., and made to look as life-like and ferocious as the real things. The jaws as well as the teeth, molded of Tenite II, are turned out at a rate of 10,000 sets a month and are marketed to taxidermists, hunters, museums throughout the country.

Molded in one piece to the exact dimensions of the animal mouth, the cellulose acetate butyrate teeth and jaws are said to be more satisfactory than natural ones. This is due to the fact that nature's bone tissue tends to shrink with age, causing teeth to fall out. This does not occur with plastic teeth. The artificial teeth have the additional advantage of not discoloring—their color and luster can be perfectly matched and will remain unchanged. Resistance to breakage has caused molded teeth and jaws to stand up well in use.

Lion and bear heads have cellulose acetate butyrate teeth

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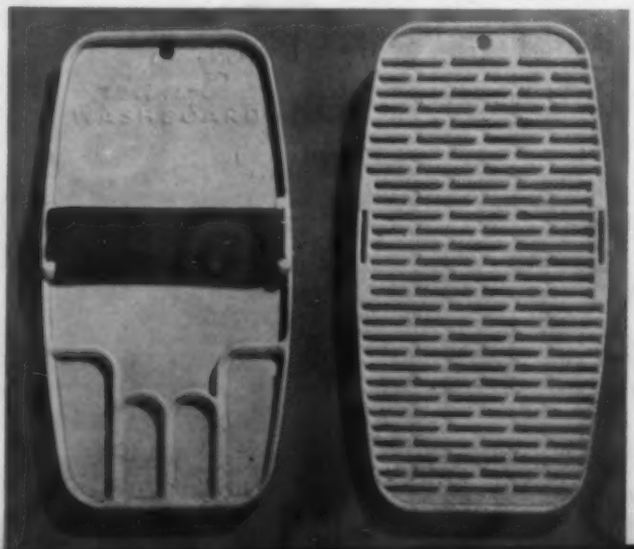
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Since the board is ideally suited to laundering small garments usually washed in kitchen or bathroom, it is made in a variety of colors to harmonize with these rooms. A molded-in hole permits it to be hung on the wall. Another useful spot for the washboard is in milady's traveling bag.



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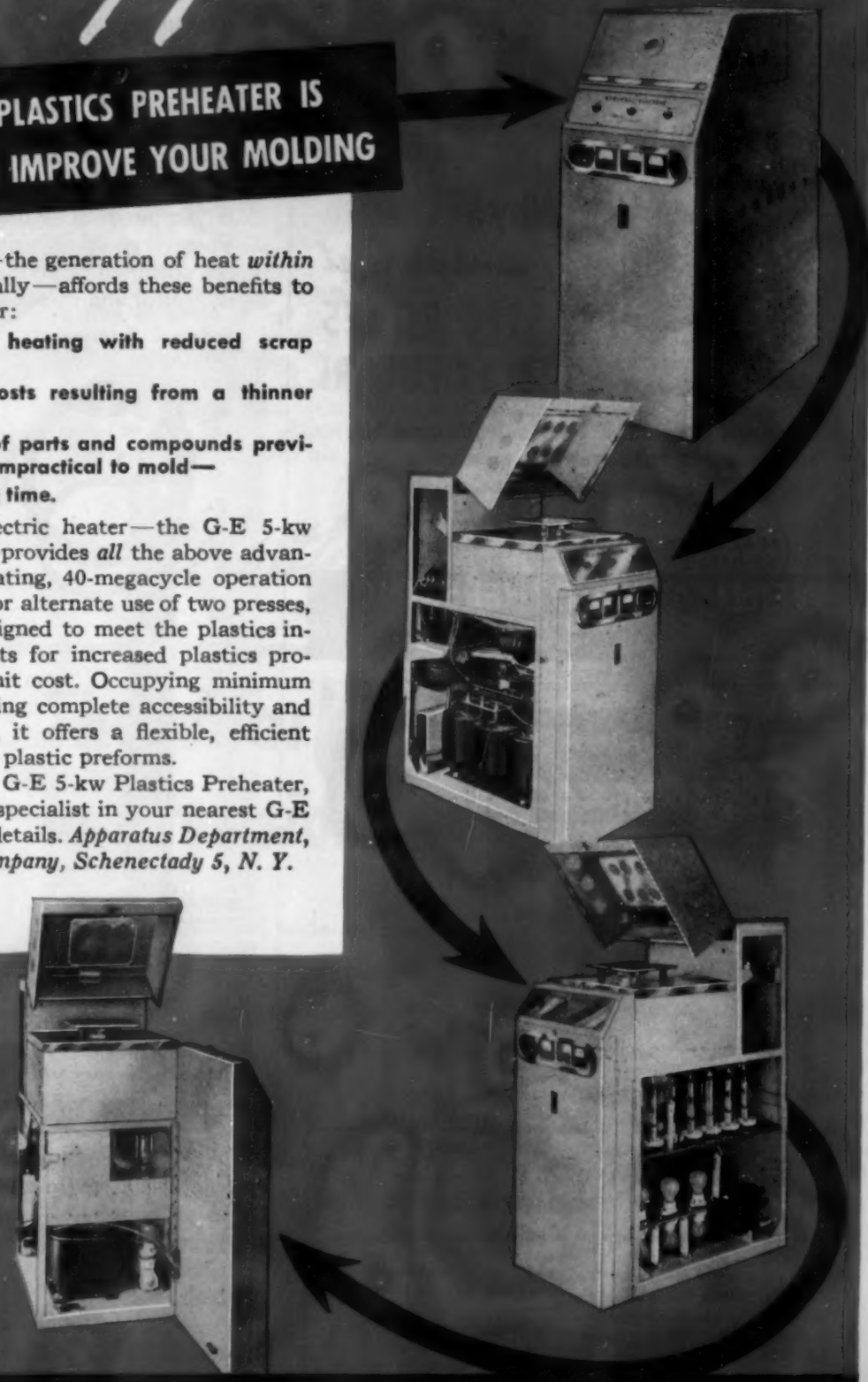
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UTILIZING a barrel of transparent Lucite, a dry air pump through which the condition of the silica gel moisture absorbing agent may be clearly observed at all times is now being produced by Andrew Co. of Chicago, Ill. Originally blue in color when dry, the silica gel gradually turns pink, then white as it becomes saturated, after which it must be replaced or removed from the pump and reactivated by heating.

Dry air pumps were designed to supply dehydrated air wherever moisture must be excluded to permit the proper operation of certain types of electrical equipment, optical and chemical apparatus, etc. Operating on the simple tire pump principle, these pumps are constructed so that the air is forced through a drying material to remove moisture before passing into the outlet hose.



Determining when the silica gel dehydrating agent should be replaced is easy when dry air pump has acrylic barrel

The original metal barrels of pumps made by Andrew Co. were constructed with special "windows" through which only a small portion of the dehydrating agent could be seen. These were found to be unsatisfactory as the gel does not change color simultaneously but rather, as moisture is absorbed with continued use of the pump, the color change begins in the crystals at the bottom of the barrel and gradually progresses to the top. Production costs also increased. The Lucite barrel model, brought out during the war, permits immediate inspection of all the silica gel in the chamber and was found to weigh much less than original model.

Andrew Co. uses acrylic tubing of $2^1/_2$-in. outside diameter and $^1/_8$-in. wall thickness, cutting the material to length and assembling it with other components. The complete assembly, including inner brass tube, pump handle, piston and other parts is sealed by neoprene compression gaskets at each end of the tubing. Besides model shown, the firm makes a small panel mounting style pump with acrylic barrel.



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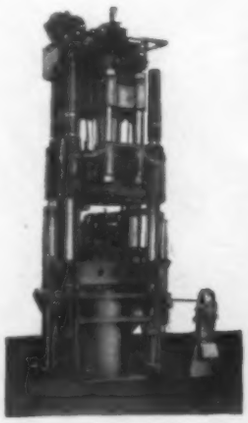
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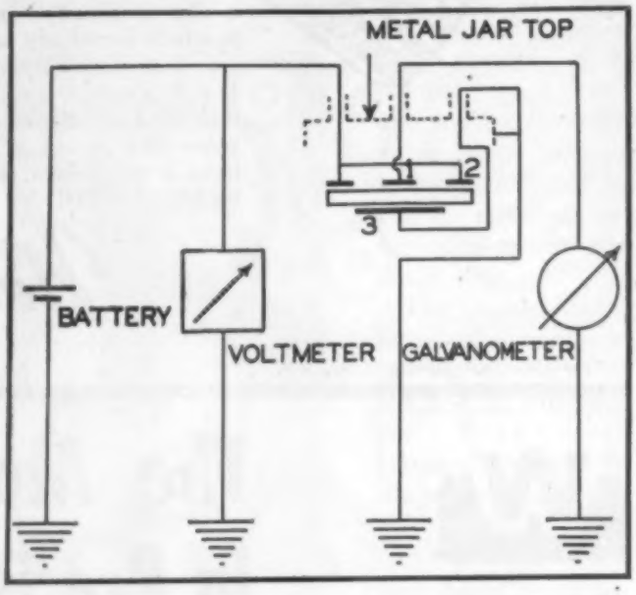
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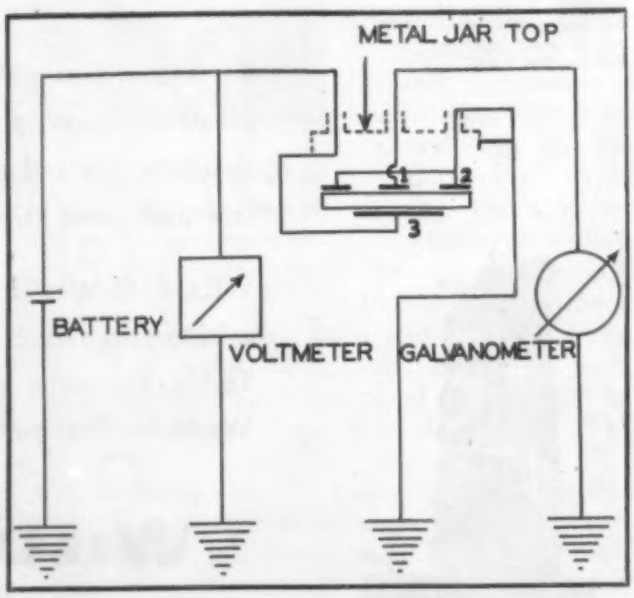
PLASTIC MOLDING
CORPORATION
SANDY HOOK, CONN.

Measuring resistances

(*Continued from page 152*) electrode, the sample may be studied for electrical change while moisture is absorbed in the volume of the material as if it were bare.

Figure 5 (page 246) shows the behavior of an LTS-E5 material, a laminated thermosetting product corresponding to NEMA grade XXXP. The designation E5 indicates that it was supposed to be of excellent electrical quality. From the high initial values of resistance this supposition is confirmed, but upon exposure to a moist atmosphere the decline is rapid. A measurement of *overall* resistance can be obtained from a 3 by 2 by $^1/_2$-in. sample with two tapered pins inserted at a





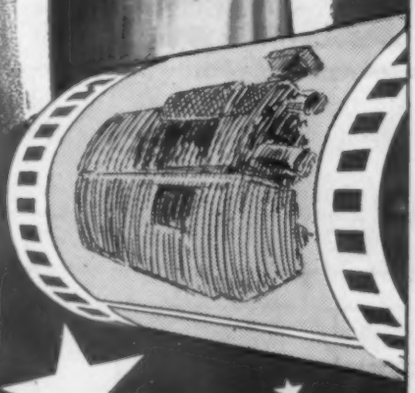
3 and 4—Top (3), Setup for testing surface resistance with use of galvanometer. Bottom (4), Arrangement for testing of volume resistance, again using a galvanometer

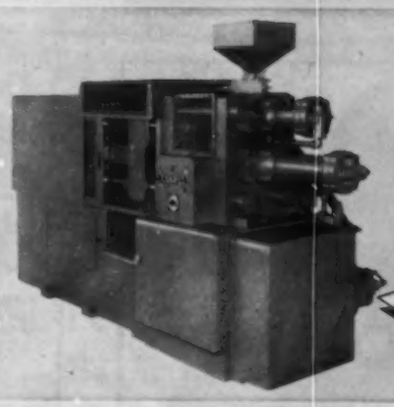
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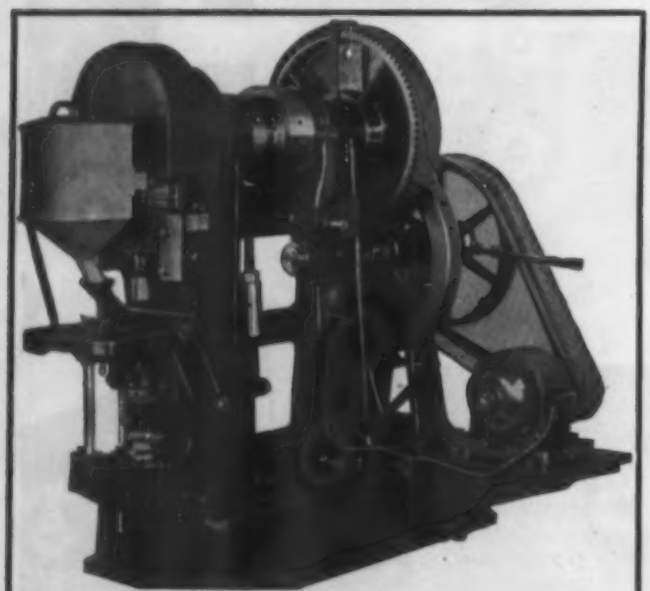
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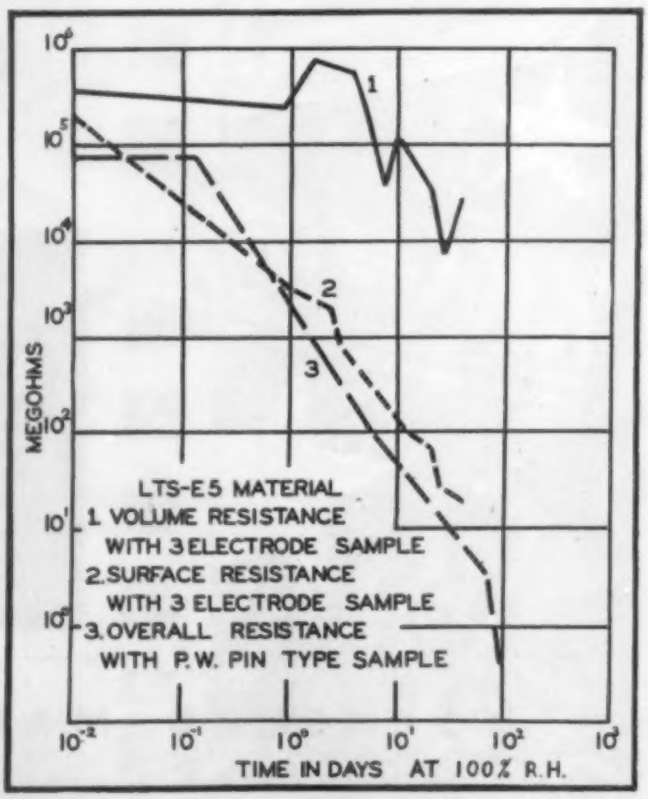
distance of one inch. This resistance decreases rapidly, but is volume or surface change the cause?

The answer is given by examining the other two curves taken from the three-electrode sample. The surface resistance changes greatly and the volume resistance changes very slowly. Apparently, in the case of this material, the surface wetted, but allowed little moisture to diffuse into the volume. Such an analysis aids in the proper application of this material. In the case of thermosetting plastics the surface is different from the volume, in that it is pure resin while the volume is made up of resin plus filler, so for this reason, the two resistances are sufficiently important to merit separate determination.

Figure 6 (page 248) shows behavior of a three-electrode type sample of a rigid thermoplastic having a moderately high moisture absorption and, unlike the laminates, being homogeneous. The graph shows the importance of separating surface and volume resistivity in that here we have a material which seems to retain its surface resistivity while volume resistivity is decreasing at a rapid rate. In electrical applications of plastics this property separation is important. An explanation of this phenomenon will require an investigation of a wider variety of materials and possibly a study of the effects of thickness of sample on the rate at which the volume resistivity decreases.

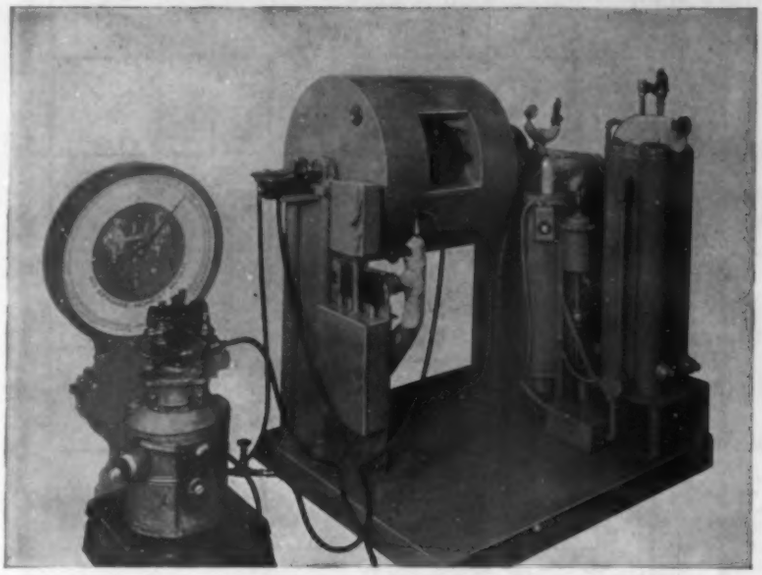
The three-electrode method for the measurement of surface and volume resistances of plastics was developed for and applied to a research project at The Johns Hopkins University sponsored by the National Defense

5—The behavior of a laminated thermosetting product



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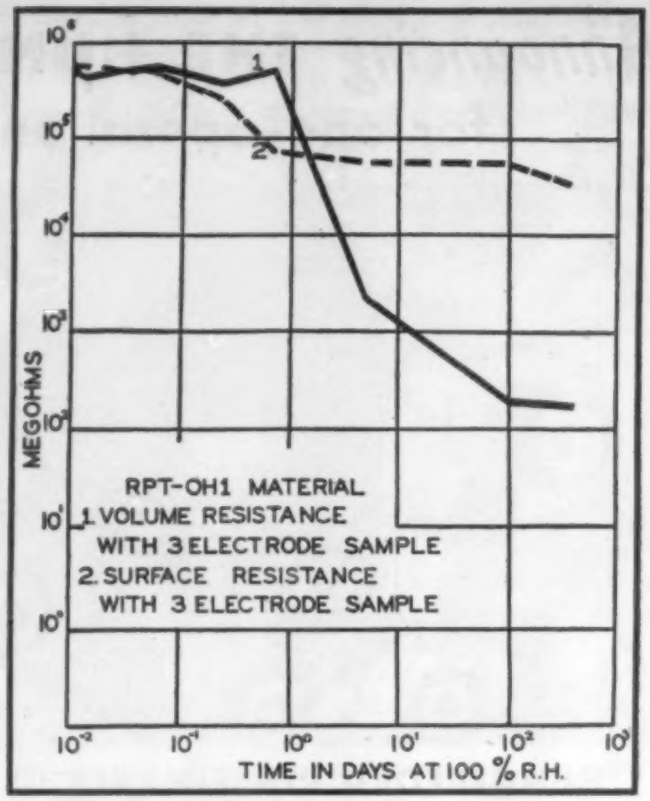
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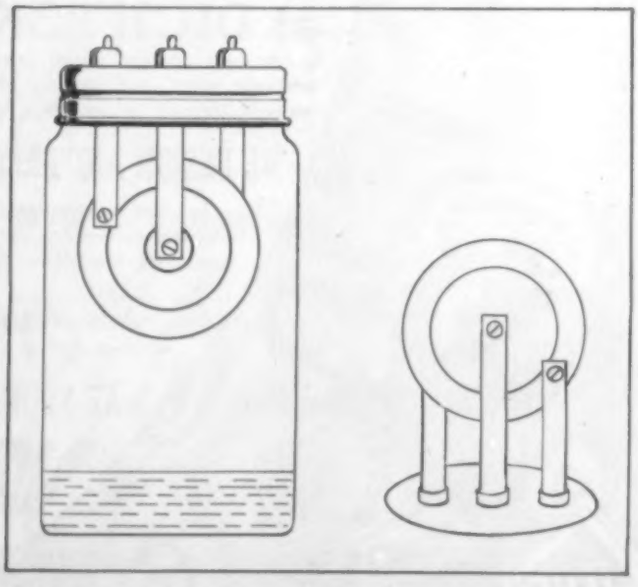
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6—This diagram shows behavior of rigid thermoplastic material which has moderately high moisture absorption

Research Committee and continued by the Engineering Services Laboratory, Army Air Forces, Wright Field, Dayton, Ohio. The authors wish to thank personnel there for aid and also Dr. M. A. Elliot of the Naval Research Laboratory, Anacostia, Va., who has developed techniques used in application of electrodes.



7—Setup for study of plastic samples under various conditions of relative humidity. Jar contains saturated salt

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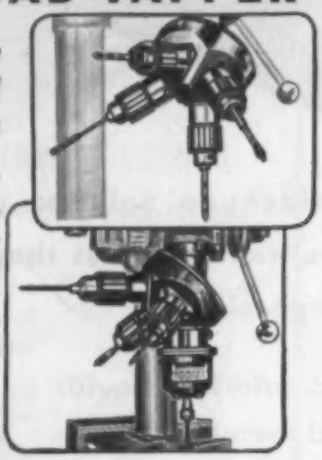
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Extending resorcinol resin glue

(*Continued from page 153*) hyde as the reaction can become violent with either acid or alkaline catalyst.

After the reaction has subsided and the resin cooled to room temperature, the pH is adjusted to 7.5 to 7.6 with aqueous sodium hydroxide as measured at a 1:25 water dilution. The novolak resin thus formed has good keeping qualities; there was no detectable change in its gluing behavior during six months' storage at 75° F.

In arriving at the above formula various mol. ratios of resorcinol and formaldehyde were tried; at a 1:0.75 ratio the reaction was difficult to control; at 1:0.70 the reaction proceeded smoothly, although the reaction product, when prepared at a pH of 7.5, tended to thicken on aging. The most satisfactory results were obtained at a ratio of 1:0.60 (used in the example) and this ratio was adopted for the present work. The final resin was always adjusted to a concentration of 60 percent solids with ethyl alcohol.

In preliminary experiments an attempt was made to extend a commercially prepared resorcinol resin but the results were unsatisfactory. After a study of the resorcinol-formaldehyde reaction and the properties of the resin, it was found that by a rather small adjustment in the pH of the commercial resin it could be extended satisfactorily with corn gluten. On storage of the commercial resin for a period of several months, a small drop in the pH to about 6.5 was observed. It was found that if the pH of the resin was readjusted to 7.5, resin could be extended satisfactorily, and it gave results equivalent to the laboratory-prepared resin.

Preparation of the extended glue

Table I shows four glue formulae containing different proportions of corn gluten. The gluten in these formulae ranges from 33⅓ to 50 percent of the total solids on a dry basis, exclusive of the paraformaldehyde used as the accelerator. To prepare the glue, the gluten is stirred into the resin by hand or with a mechanical mixer until the glue is smooth and stiff. Ethyl alcohol (95 percent) is added until a suitable spreading consistency is obtained and finally the paraformaldehyde is added. The paraformaldehyde institutes an exothermic reaction and it is advisable to cool the finished glue in order to increase its working life. The gluten is largely dispersible in the alcohol resin combination and the resulting glue is of a very smooth consistency. It is

Table I.—Formulae for Glue Preparation Containing Various Proportions of Corn Gluten

Components	*Glue formulae*			
	I	*II*	*III*	*IV*
Resin solution (60% solids), grams	50	50	50	50
Corn gluten, grams	15	20	24.5	30
Paraformaldehyde, grams	5	5	5	5
Ethyl alcohol (95%), grams	24	28	36	44
Corn gluten,* percent	33⅓	40	45	50

* The percentage of corn gluten is on a dry solids basis exclusive of the paraformaldehyde.

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Table II.—Effect of Resin-Accelerator Ratio on Shear Strength and Wood Failure of 3-Ply Birch Specimens

Paraformaldehyde in 50 grams liquid resin	*Shear strength and wood failure*[a]					
	Dry		*48-hr. soak in water*		*3-hr. boil in water*	
grams	*p.s.i.*	*%*	*p.s.i.*	*%*	*p.s.i.*	*%*
3	428	(3)	395	(70)	488	(90)
4	572	(70)	602	(98)	538	(100)
5	518	(100)	495	(98)	510	(100)
6	505	(100)	545	(100)	454	(100)

[a] First figure is shear value according to the test procedure in Army Air Forces' Specification No. 14124 (Jan. 12, 1944), while second figure (in parentheses) refers to percentage wood failure after shearing. Reported results are the average of 6 to 10 breaks.

possible to substitute water for part or all of the alcohol but this will cause some loss in the spreading characteristics of the glue.

Preparation of test panels

In making plywood shear tests, $^1/_{16}$-in. thick veneers of selected yellow birch (furnished through the courtesy of the U. S. Forest Products Laboratory) were used. Three-ply panels were made by double spreading the veneer by hand. Sufficient glue was used to insure its squeezing out when pressure was applied. Pressure was applied by heavy wood carpenter clamps over the entire face of the panel. Unless otherwise stated, all clamp periods were 18 hours. This was a convenient period of time and experience showed this to be more than a sufficient interval. The setting temperature was 75 to 80° F. In all cases at least 120 hr. elapsed between mixing the glue and testing the joint.

Test results

After a series of preliminary tests to show the feasibility of the process, the first factor to be evaluated systematically was the amount of accelerator or paraformaldehyde required for setting up the resin. These data are shown in Table II. The glue formula is Number I (see Table I) except for the variation in the amount of paraformaldehyde. The paraformaldehyde variation with respect to resin is shown in Table III. The data in Tables II and III show that 4 to 5 grams of paraformaldehyde should be used as an accelerator for each 50 grams of the resin as prepared above or about 10 percent of the weight of the liquid resin; this value was adopted as standard for later glue preparations.

Next, a series of experiments was made to determine

Table III.—Resorcinol-Formaldehyde Ratios after Addition of the Accelerator[a]

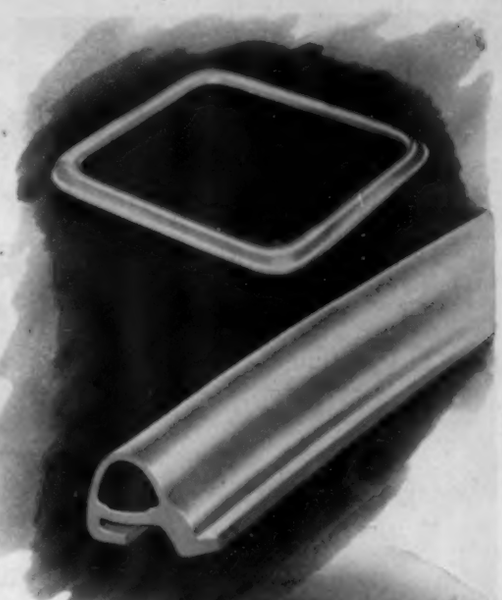
Para	*Para, as mols. of HCHO*	*HCHO in 50 grams, original resin*	*Total HCHO*	*Ratio resorcinol*[b] *to HCHO*
grams	*mol.*	*mol.*	*mol.*	
3	0.100	0.138	0.238	1:1.03
4	0.133	0.138	0.271	1:1.18
5	0.167	0.138	0.305	1:1.31
6	0.200	0.138	0.338	1:1.46

[a] Para = paraformaldehyde; HCHO = formaldehyde.
[b] The liquid resin contains 0.231 mol. resorcinol per 50 grams.



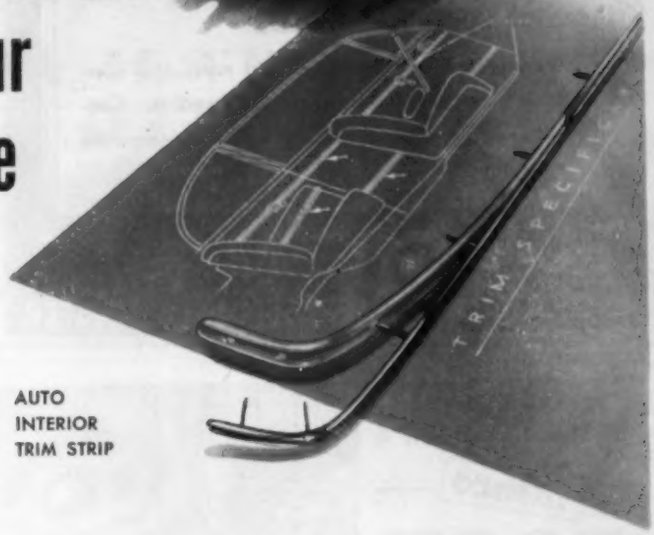
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the permissible amount of extender that could be used with the resorcinol resin. Glue preparations were made up according to the four formulae given in Table I and tested according to standard methods. The results of these tests, given in Table IV, show that the resorcinol resin can be extended with as much as 45 percent corn gluten on the basis of total solids without an apparent loss of adhesive strength or water resistance. In the usual terminology used for glue work this extension would be 82 percent based on the original amount of resin.

Table IV.—Test Results for Glue Formulae Containing Various Ratios of Corn Gluten to Resin

Formula No.[a]	*Ratio of gluten to resin*	*Shear strength and wood failure*[b]					
		Dry		*48-hr. soak in water*		*3-hr. boil in water*	
		p.s.i.	*%*	*p.s.i.*	*%*	*p.s.i.*	*%*
I	33:66	518	(100)	495	(98)	510	(100)
II	40:60	678	(98)	579	(100)	475	(100)
III	45:55	541	(91)	521	(100)	503	(96)
IV	50:50	555	(29)	557	(100)	447	(47)

[a] See Table I.
[b] See footnote, Table II.

After the addition of the accelerator the resorcinol-formaldehyde reaction proceeds toward completion and the product if not used at this stage soon becomes useless as a glue. It is important therefore to know the workable or *pot life* of the glue. A series of tests on pot life was made in the time range of 2 to 3 hours. In these tests the time was measured from the addition of the accelerator to the time of spreading. The temperature of the glue was maintained at 75° F. with occasional stirring. The results are shown in Table V, from which it is concluded that the extended glue has a workable life of about 3 hours. This is about the same pot life as reported by Rhodes for a commercial resorcinol glue.

Table V.—Determination of Pot Life of the Glue at 75° F.

Time[a]	*Shear strength and wood failure*[b]					
	Dry		*48-hr. soak in water*		*3-hr. boil in water*	
min.	*p.s.i.*	*%*	*p.s.i.*	*%*	*p.s.i.*	*%*
120	518	(100)	555	(100)	448	(100)
150	595	(100)	547	(100)	485	(100)
165	582	(97)	593	(100)	550	(100)
180	487	(100)	453	(100)	434	(100)

[a] Time interval between addition of accelerator and spreading of the glue.
[b] See footnote to Table II.

In making up test panels they were spread with glue at 0.5 or 1.5 hr. after addition of accelerator to the glue. The panels were laid together immediately after spreading and the clamps applied within 15 min. after assembly. The validity of this procedure and the allowable open assembly time were determined by a series of tests using Formula II. The double spread veneers were left open to evaporation for 15, 30 and 45 min. before assembly; results are shown in Table VI (page 256). From the results shown in this table, it appears that

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Table VI.—Determination of Open Assembly Time

Open assembly time	*Shear strength and wood failure*[a]					
	Dry		*48-hr. soak in water*		*3-hr. boil in water*	
min.	*p.s.i.*	*%*	*p.s.i.*	*%*	*p.s.i.*	*%*
15	483	(100)	533	(100)	476	(100)
30	529	(11)	513	(95)	435	(93)
45	413	(60)	475	(89)	465	(93)

[a] See footnote Table II.

the extended glue will tolerate an open assembly time up to 45 min. when used with a glue not older than 90 minutes.

The results of variation of clamp time for unstressed specimens are shown in Table VII. These data show

Table VII.—Effect of Variation in Clamp Time

Time under pressure	*Shear strength and wood failure*[a]					
	Dry		*48-hr. soak in water*		*3-hr. boil in water*	
hr.	*p.s.i.*	*%*	*p.s.i.*	*%*	*p.s.i.*	*%*
6	493	(93)	420	(100)	418	(100)
8	470	(98)	497	(100)	395	(100)
10	543	(100)	450	(100)	434	(100)
12	503	(100)	488	(100)	440	(100)

[a] See footnote to Table II.

that a clamp time of 6 hr. at 75° F. is satisfactory. Higher temperatures would shorten this period.

The Army Air Forces Specification No. 14124 of January 12, 1944, for low-temperature-setting phenol, melamine and resorcinol base glue, requires that a block shear test on maple shall develop an average strength of 2800 p.s.i. This block shear value appears to be an accepted standard for a cold-setting resin glue. Block shear tests were therefore carried out in a standard manner using Formulae II and III. The average for a series of tests on Formula II was 3580 p.s.i. with 53 percent wood failure. For Formula III the average was 3265 p.s.i. with a wood failure of 33 percent.

German thermosetting resins

(*Continued from page 154*) acetone against the fall in acetone alone. In case it is $^{20}/_{100}$ min. for acetone and $^{140}/_{100}$ min. for resin solution, the Ostwald viscosity is 7.

The resin so prepared is then melted by hand stirring in a warm water bath at 80° C. for 1 to 2 hr. after which it can be poured into lead molds for casting as required. The molds are placed on wagons fitted with shelves and pushed into an oven where they are cured for 24 hr. at temperatures which start at 70° C. and gradually rise to 80° C.

Manufacture of Luphen lacquer resins[3]

Luphen AT—A mixture of 1100 kg. phenol, 2000 kg. formaldehyde (30 percent by weight), 6.5 kg. potas-

[3] "Investigation of German plastics plants, Part 1," by G. M. Kline, J. H. Rooney, J. W. C. Crawford, T. Love and F. J. Curtis. PB 949. See also "Plastics in Germany, 1939–1945," MODERN PLASTICS 23, 152 M (Oct. 1945) and 23, 159 (Dec. 1945).



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sium carbonate and 200 liters water is heated while stirring under reflux to a temperature of 80° C. The temperature is allowed to rise to 98 to 100° C., and is maintained in this range for 2 hours. The reaction products are then cooled to 90° C. and 10 kg. citric acid are added.

The process from this stage is controlled by viscosity. A sample of the reaction mixture is withdrawn and allowed to separate; 120 grams of resin layer are dissolved in 30 grams ethyl alcohol and viscosity is measured in a Ford cup. When the viscosity is 20 sec., 5 kg. oxalic acid are added and the mixture is stirred at a temperature of 85 to 90° C. until the viscosity is 120 seconds. The entire process to this stage usually requires about 5 hours.

The stirrer is then stopped and the two layers are allowed to separate. The upper water layer is removed and 1200 liters of hot water at 80° C. are added. The mixture is stirred for a short time and again allowed to settle. The water layer is again removed and 1000 kg. of butanol are added. The water and butanol are distilled off until no further water distills at 84 to 85° C. under a pressure of 160 mm. Hg. Then 250 kg. butanol are added to give solution with 60 percent resin.

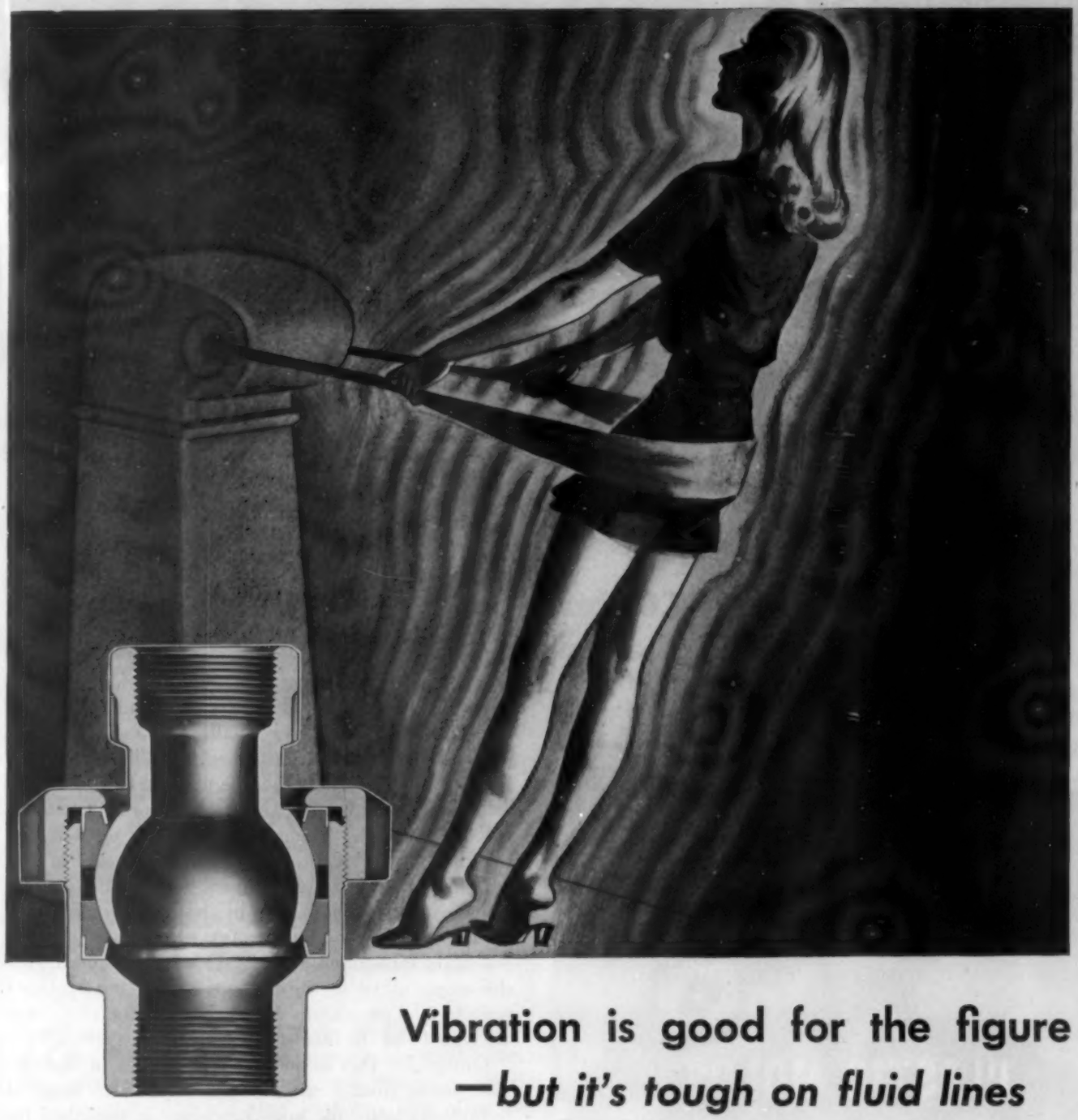
To this are added 1150 kg. of adipic trimethylolpropane alkyd, calculated as 100 percent adipic ester. This is made by heating 100 parts adipic acid with 112 parts of trimethylolpropane at 160° C. under a pressure of 300 mm. Hg. This process requires 8 hr. and from a charge of 3500 kg., 500 kg. of water are distilled. Butanol is added to give a solution containing 72 percent of the ester. The acid number of the alkyd is 30. This alkyd resin is referred to as the soft resin.

The proportion of phenolic resin to alkyd is 1:1. Ten kilograms of a 10 percent solution of ethyl cellulose in a mixture of butanol (15) and xylol (85) is added to 1000 kg. of the mixed phenolic alkyd solution. Ethyl cellulose is made by Elberfeld and is referred to as medium grade with a K value of approximately 80. To the mixture made so far, 22.5 kg. (0.5 percent) of citric acid are added to prevent discoloration of the lacquer when it is used on an iron surface. The mixing of the phenolic resin with the alkyd, ethyl cellulose and citric acid is done at 50° C. and the whole mixing process takes approximately 2 hours.

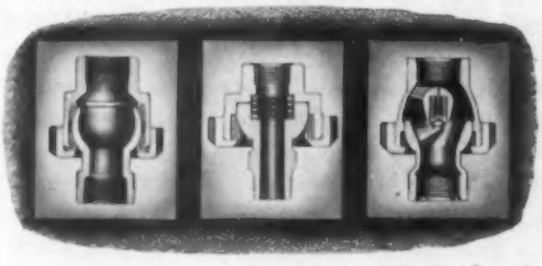
Luphen AT is used for coating metals by air-drying for 2 hr. followed by baking at 180° C. The time for baking at this temperature is approximately 30 min., but temperatures in the range of 180 to 300° C. can be used, depending on whether good elasticity or good chemical resistance is required. It is further claimed Luphen AT has good acid resistance and elasticity.

The other grades of Luphen made from phenol are produced in the same manner, but the proportions of phenolic resin to alkyd are different. The more phenolic resin added, the harder will be the final coating. In every case, ethyl cellulose and citric acid are added as in Luphen AT.

Luphen SW—This lacquer is made from xylenol fraction, boiling point 203 to 218° C. It is said to be



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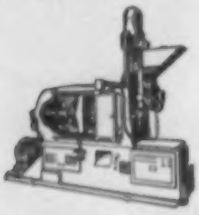
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free from cresol. A mixture of 1220 kg. xylenol, 15 kg. formaldehyde (30 percent) and 5 kg. potassium carbonate is heated to 65° C. and the temperature is allowed to rise to 75° C. This usually takes 25 to 30 minutes. The temperature is held at 75° C. for 4 to 5 hours. Samples are withdrawn at intervals until the viscosity, as determined in a Ford cup by the technique previously described, is 145 to 150 seconds. Ten kilograms of citric acid are then added. The mixture is stirred for 10 min. and the temperature allowed to drop to 65° C. The resinous layer is allowed to settle and the water is removed. The resin is then washed with 1400 kg. water, and again allowed to settle and the water separated. One thousand kilograms of butanol are then added and the process is thereafter the same as for Luphen AT. The final solution is adjusted to 60 percent; ethyl cellulose and citric acid are then added as before. The ratio of xylenol resin to alkyd is 4:6.

Luphen BM—This is made from *p-tert.*-butyl phenol. A mixture of 760 kg. molten *p-tert.*-butyl phenol and 2350 kg. 30 percent formaldehyde is heated to 50° C. Then 165 kg. of a 20 percent solution of sodium hydroxide are added slowly; temperature increases to 60° C. in 20 min. and is maintained at this point for 2 hours. The resinous layer is allowed to separate and the water is removed. Then 1800 liters of water at 80 to 90° C., 33 kg. of 96 percent sulphuric acid are added.

The mixture is heated for 10 min. under reflux at 97° C. The resinous layer is allowed to separate, the water is removed and a further 1300 liters of water at 80 to 90° C. are added. The mixture is then heated under reflux for 7 min., the water separated and the process repeated. The remaining water is then distilled off at 130° C. under a reduced pressure of 150 mm. Hg. until the softening point is 75 to 80° C. The softening point is determined by the method of Kramer-Sarnaw-Nagel. The mixture is cooled to 100° C. and 400 kg. of butanol are added. This resin is mixed with the adipic alkyd in the proportion of 7 butyl phenol resin to 3 adipic alkyd. Ethyl cellulose and citric acid are added and the final solids content is 60 percent.

Luphen L—This lacquer is prepared from a phenolic resin made from 1 mol. of phenol and 1.2 mols. of formaldehyde by the same procedure as described for the phenolic resin in Luphen AT, except that alcohol is used as the solvent and 1 percent of a resorcinol-formaldehyde resin is added to speed up hardening. The resorcinol resin is added to the final product. Hardening is done by the addition of a 12 percent alcoholic hydrochloric acid solution. The main use of Luphen L is for cold-setting coatings and lacquers. It gives a good elastic coating with good water resistance and good electrical properties.

Luphen OH—This is prepared from a phenolic resin made from 1 mol. of phenol and 1.8 mol. formaldehyde. It contains no resorcinol resin.

Luphen 3198—This is a solid phenolic type resin made from a mixture of phenol and cresol. A mixture of 0.66 mol. cresol (55 to 60 percent *m*-cresol, residue *p*-cresol, no ortho) and 0.34 mol. phenol (1 mol. total



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phenolic) with 1 to 1.5 mols. formaldehyde is heated with aqueous ammonia (20 percent solution: 50 cc. per mol. phenolic component). This is refluxed for 45 to 50 min. until it clouds. The water is removed and the resin phase dissolved in ethyl alcohol. It is distilled to a final liquid temperature of 100° C. The resin is solid with a softening point of 60 to 65° C. (mercury in capillary tube, Carleton Ellis). The product is mixed with the alkyd. The coatings are more elastic than those of phenol but have poorer water resistance.

Manufacture of urea Plastopal lacquers

Two main types of urea lacquer resins are made. Those are Plastopal AT and Plastopal AW. Both of these materials are supplied in several solvents and at different concentrations. These lacquers are essentially a urea-formaldehyde condensation product, mixed in solution with an alkyd type resin made from trimethylolpropane and adipic acid. The plant for producing trimethylolpropane by condensation of 1 mol. of butylaldehyde with 3 mols. of formaldehyde in alkaline solution was destroyed in 1944 and an alkyd from hexanetriol and adipic acid was used latterly. The materials in which hexanetriol was employed were designated Plastopal ATH and Plastopal AWH. These latter materials were made beginning October 1944.

The lacquers containing trimethylolpropane alkyd are preferred because they give finished coatings with lighter color, better color stability and better water resistance than those using hexanetriol. The monthly output of Plastopal AT and Plastopal AW was 150 tons per month, calculated on the solid resin content. Of this total, Plastopal AT accounted for approximately two-thirds. They were used in baking and air-drying varnishes for wood, metals, etc.

The urea condensation product is made by heating a charge of 2800 kg. of butanol, 1850 kg. of formaldehyde (40 percent solution), 90 kg. of 25 percent solution ammonia and 640 kg. of urea. These products are reacted together for 1 hr. at a temperature of approximately 95° C. Alkyd resin (72 percent solution) in the amount of 1775 kg. are added to make Plastopal AT and the water is removed by distilling, separating the alcohol from the water and returning the alcohol to the reaction vessel. All the water is removed in this manner and the temperature of the product is raised to 118° C. More butanol is then added to give 5000 kg. of a product containing 50 percent solids. The amount of butanol to be added is calculated on the amount of water and butanol removed. The whole process requires 24 hours. It is believed that an interaction takes place between the urea condensation product, corresponding to dimethylol urea, and the soft resin. The product is referred to as the hard resin.

Plastopal AW—This material is produced from Plastopal AT by adding more soft resin at a temperature of 80° C. The proportions are: 1780 kg. Plastopal AT (50 percent solution), 3320 kg. soft resin and 1460 kg. butanol. This gives 8000 kg. of Plastopal AW containing 50 percent solids.

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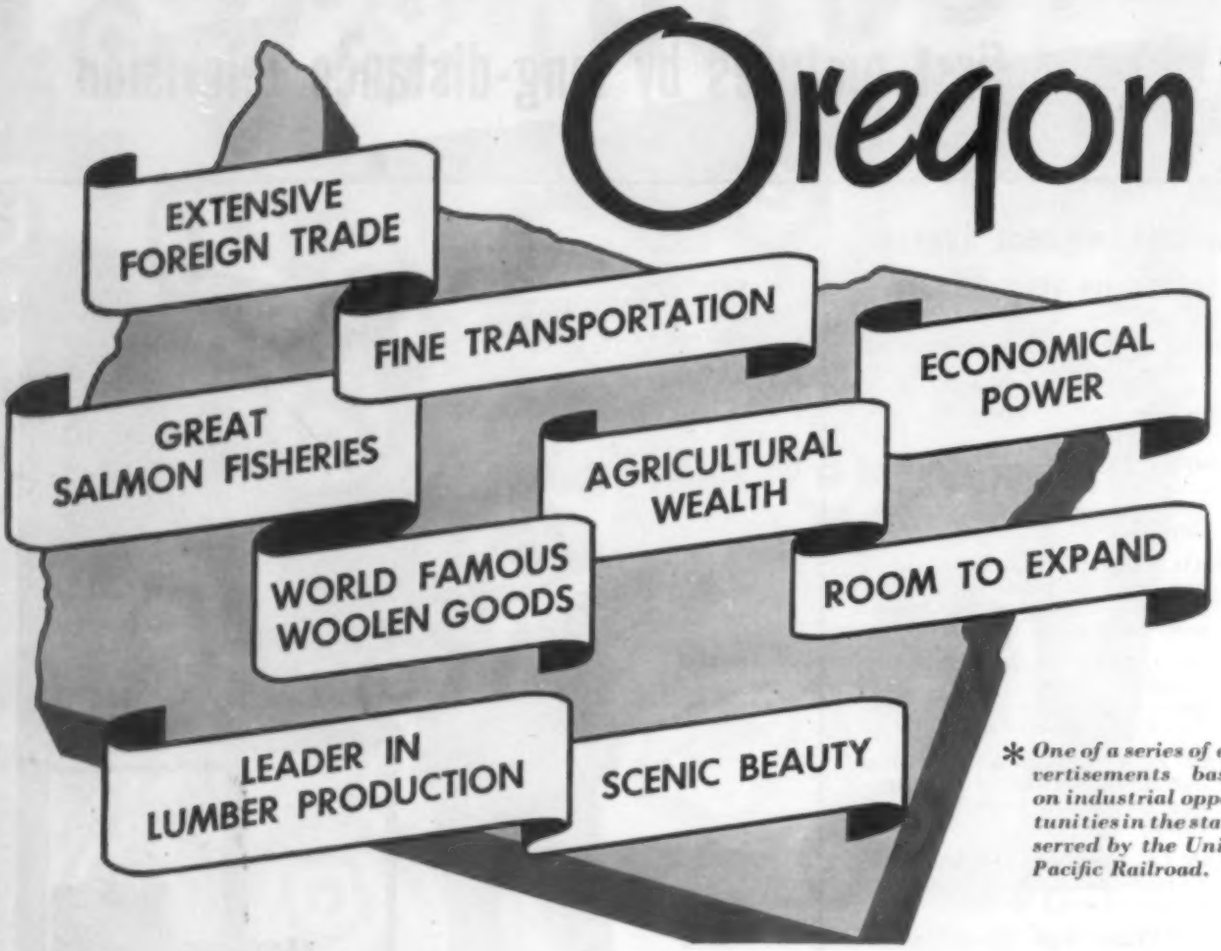
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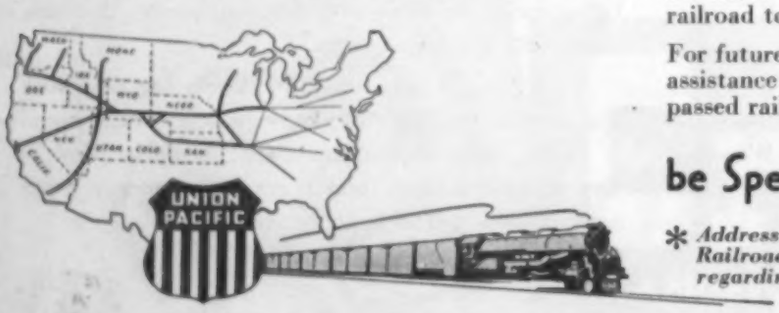
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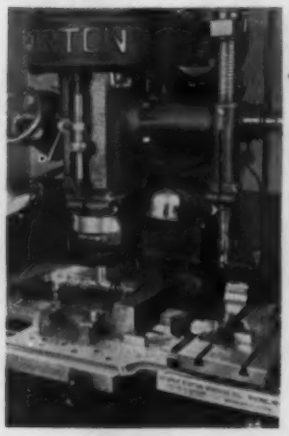
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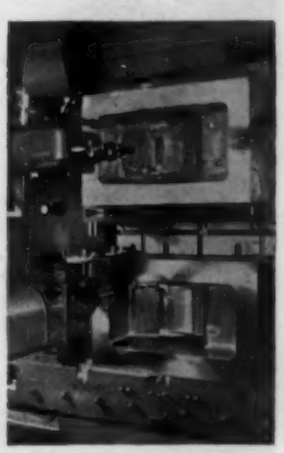
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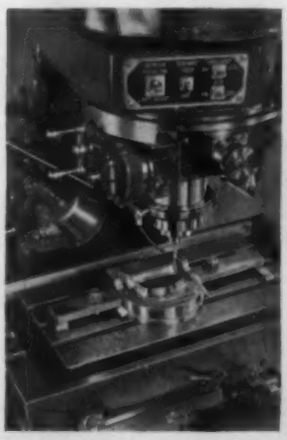
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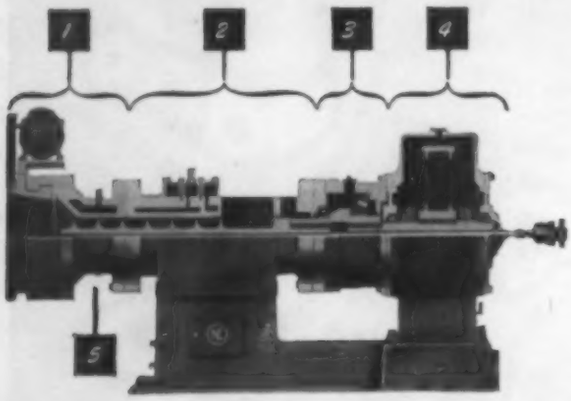
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4–GEAR REDUCTION UNIT
5–STOCK SCREW

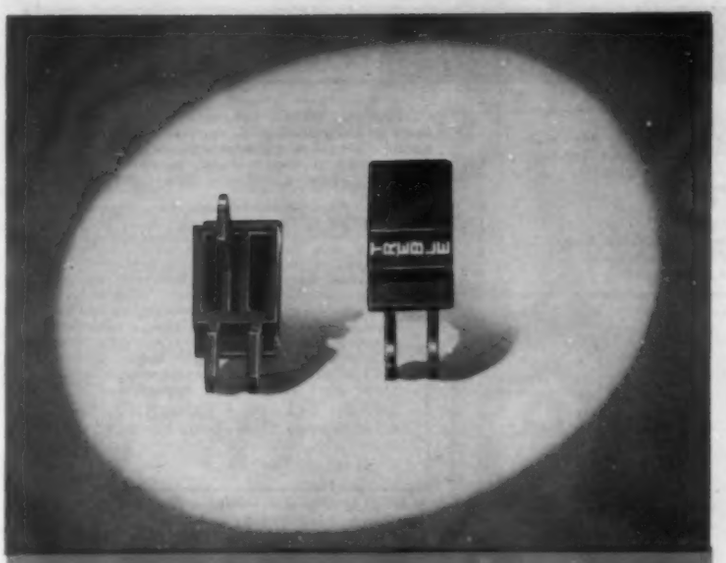
Shown above is an 8½" NE Extruder. It has a wide application in processing natural and reclaimed rubber, plastic materials and extruding finished plastic shapes. Like all NE Tubers, it features heavy unit construction for long trouble-free service and ready accessibility for inspection.

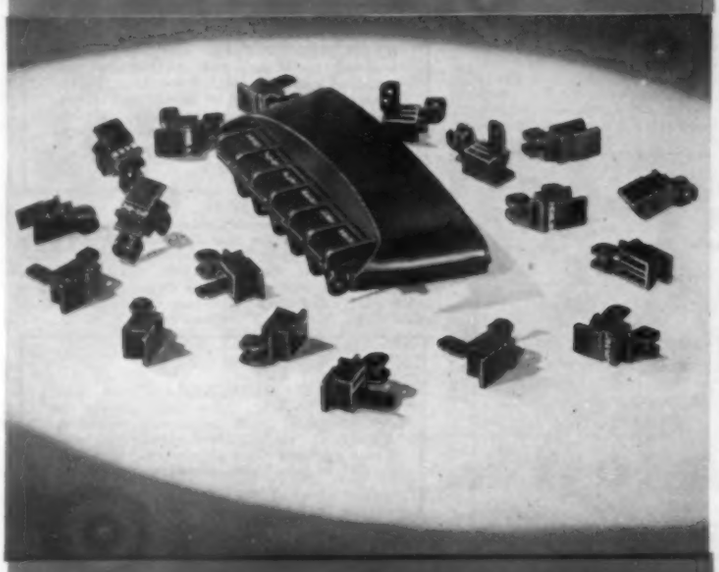
No two applications are alike. Materials and processing speeds vary. NE engineers work closely with your engineers to get the best combination of unit assemblies. Great advance has been made in electric heating element design which considerably improves performance.

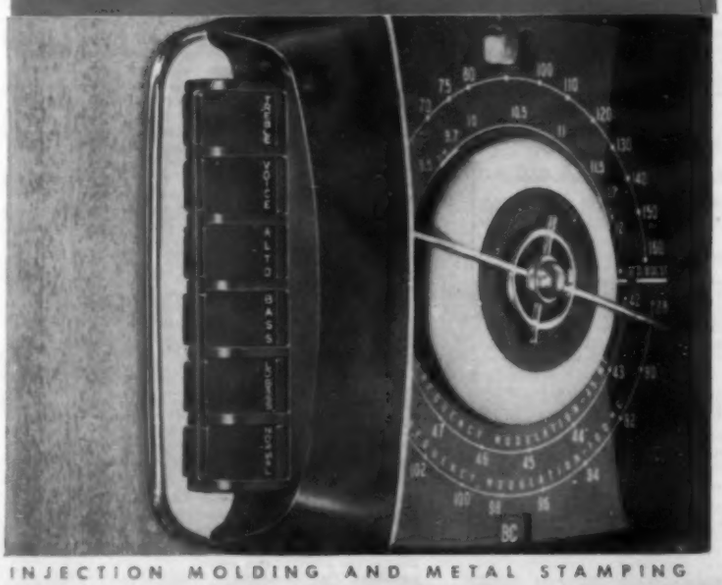
We have supplied almost every leading processor of basic plastic and rubber materials and have a wealth of general experience to help you in working out your special application. Write us today about your extrusion problems.

• *Write for copy of our general catalog that fully describes this 5-unit construction.*

NATIONAL ERIE CORPORATION
ERIE, PENNSYLVANIA • U. S. A.







Santay

SYMBOL OF PRECISION CRAFTSMANSHIP

THE WHOLE IS EQUAL TO THE SUM OF ALL ITS PARTS

AND no part is more important to the beauty and functioning of the Zenith Radiorgan than the organ push button illustrated—OR harder to make. The intricacy and accuracy of the part is the reflection of a master mold designed and constructed in SANTAY Corporation's new, modern, up-to-the-minute toolroom. Although simple in appearance, the piece part is the result of an infinitely complex mold structure made up of 192 separate individual matched sections which form a complete 8 cavity mold.

Molding organ push buttons for the Zenith Radio line has been our forte for years. This record of achievement stands on its own merit as a highlight of the designer's and mold maker's art. We are justifiably proud of our record of tough jobs—and welcome such inquiries as a matter of routine.

Perhaps we could be of service to you and add your name to our list of satisfied plastic customers. Your inquiries will be given prompt attention and priced accurately.

INJECTION MOLDING AND METAL STAMPING • ELECTRO-MECHANICAL ASSEMBLIES

SANTAY CORPORATION, 355 NORTH CRAWFORD AVE., CHICAGO 24, ILLINOIS

REPRESENTATIVES: POTTER & DUGAN, INC., 29 WILKESON STREET, BUFFALO 2, NEW YORK • PAUL SEILER, 7779 CORTLAND AVENUE, DETROIT 4, MICHIGAN • QUEISSER BROS., 110 E. NINTH STREET, INDIANAPOLIS 2, INDIANA

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Classified Advertisements

For further information address Classified Advertising Dept. MODERN PLASTICS 122 East 42nd St., New York 17, N. Y.

WANTED: PLASTIC SCRAP OR REJECTS in any form. Cellulose Acetate, Butyrate, Polystyrene, Acrylic, Vinyl Resin, etc. Also wanted surplus lots of phenolic and urea molding materials. Custom grinding and magnetizing. Reply Box 318, Modern Plastics.

FOR SALE: Hyd. Presses, 1 self contained fully aut. 5 ton Denn., 1—36" x 36", 14" ram, 200 ton, 1—26" x 52", 14" ram, 385 ton; 5—12" x 12", 7½" rams, 50 ton; 2—15" x 15", 8" ram, 75 tons; 1—15" x 15", 10" ram, 100 tons; 3—19" x 24", 10" ram, 75 tons; 3—13" x 19", 12" ram, 100 ton; 1—20" x 20", 13" ram, 200 tons with pullbacks; 3—23" x 17½", 8" rams, 75 tons with pullbacks; 1—16" x 17", 8" ram, 75 tons, 1—22" x 15", 6" rams, 75 ton; 7—12" x 13", 6½" ram, 50 ton; 4—8" x 9½", 4½" ram, 20 ton; 3—1000 ton 29" ram presses; 3—2043 ton presses, 54" ram; 1—24" x 30", 550 ton, 15" ram; 1—20" x 20", 10" ram, 100 ton; Pumps: 1—HPM triplex 1½ GPM 2500#, 1—Rob. Dup. 1½ GPM, 4000#, 1—Gould Trip. 12 GPM 1250#, 1—Worth 2½ GPM 4000#, 1—Worth. Trip. 12 GPM 2500#, 1—Elmes Dup. 1½ GPM 2850#; Preform Presses, Stokes Model T single punch. 1—DDS—2 Stokes, 1—Kux ICS Extr.; 1—Royle Perfected #3 cont. motor bedplate, 1—Housatonic 6# worm, Mills, Calenders, Mixer Laboratory Presses, Accumulators, Hydropneumatic and weighted types, etc. HIGHEST PRICES PAID FOR YOUR USED EQUIPMENT. Universal Hydraulic Machinery Company, 285 Hudson Street, New York City 13.

HYDRAULIC PUMPS

Aldridge Pump Co. Vertical Triplex HYDRAULIC PUMPS, 2¾" x 8", equipped with Herringbone Gears, 67.5 gpm. Maximum pressure for intermittent duty 2,200 lbs., for continuous duty 1,800 lbs. Pump and motor mounted on common bed plate. Motors are 75 HP, 3/60/220-440 volts, 740 RPM. Complete with starting panel, consisting of G.E. motorstarter switch, push button control, square "D" Switch, and capacitator.
Purchased new 3½ years ago. Excellent condition. Available for immediate delivery. Reply Box C268, Modern Plastics.

DO YOU NEED a Hydraulic Press for Compression Molding, Transfer Molding, Laminating, Forming, Bending and Hobbing? Whatever it may be, if it is hydraulic, see Sal-Press Company, 388 Warren Street, Brooklyn, N. Y.

FOR SALE: Angle Molding Hydraulic Press Watson-Stillman, suitable for Split Molds, and for Molding Complicated Parts by the transfer method. 3 horisontal double acting rams, 13½", 8" and 6" arranged in "T". Reply Box C132, Modern Plastics.

IN THE MARKET FOR: Stainless Steel or Nickel Kettles, Vacuum Pan, Preform Machine and Mixer, Hydraulic Presses. Reply Box 825, Modern Plastics.

Chemist or Chemical Engineer experienced in the production and formulating of phenolic molding compounds. Position of responsibility located Middle West. State qualifications. Address Box C287, Modern Plastics.

FOR SALE—1—12" x 12" Press 7" Ram, Steel Heated Platens and Hand Pump attached; 1—24" x 24" Adamson, 10" ram, 2-opening Hydraulic Press; 1—24" x 24" Farrel, 10" ram, 2-opening Hydraulic Press; 1—30" x 30" D&B, 2-open, steel heated Platens 12" ram; 2—La Pointe Hydraulic Pumps, 150 G.P.M.—3000 lb. pressure direct motor driven to 125 HP AC motors; 1—French Oil Hydropneumatic Accumulator; 1—14" x 24" Press, 9" ram; 6—Hydraulic Presses, 20" x 20", 12" x 14"; Dry Powder Mixers; Pulverizers, Grinders, etc. Send for complete list. Reply Box 1545, Modern Plastics.

AVAILABLE—A Mechanical Engineer wishes to connect with a going compression plastic manufacturing concern as plant engineer or master mechanic having full supervision over plant equipment, engineering, designing, machine shop and tool room depts. Have had a number of years experience and willing to locate anywhere. Reply Box C271, Modern Plastics.

WANTED: THERMOPLASTIC SCRAP or rejects in any form, including Acetate, Butyrate, Styrene, Ethyl Cellulose, Acrylic and Vinyl Resin material. Submit samples and details of quantities, grades, and color for our quotations. Reply Box 308, Modern Plastics.

HAVE AVAILABLE time for compounding vinyl resins on Banbury, mill and calender equipment. Also granulating equipment.
Address replies to:

Mr. A. V. Lynas
% Sav-Way Industries, Inc.
Box 117—Harper Station
Detroit 13, Michigan

FOR SALE—Large quantity vinyl flexible sheeting in rolls (approximately 250 lbs. to roll) 48" width, .020 thickness, colorless, translucent, immediate shipment. Write for samples. Reply Box C319, Modern Plastics.

Wanted

Clean Vinyl Scrap

Preferably Clear Types.

Also—Virgin Material, Plasticizers. Submit offer to Box C270, Modern Plastics.

FOR SALE: Plastic vinyl scrap. Large quantities, all colors, .004 to .020 gauge. Scrap sorted to individual colors and cleaned. Steady source. This scrap from handbag, curtain, belt and etc. manufacturers. Top quality. We buy any type plastic scrap. G. E. Zeigler & Company, 2 Second Street, Clifton, New Jersey.

WANTED

Industrial Enterprise

CASH PAID

For Capital Stock or Assets

by large financially powerful diversified organization wishing to add another enterprise to present holdings. Existing Personnel Normally Retained

Strictly Confidential

Box 1230, 1474 B'way, New York, N. Y.

PLASTICS ENGINEER and chemist, long diversified experience in compounding, testing, research, development and production of all types of plastics; fully acquainted with machinery, methods of production and standards, seeks responsible position of a supervisory, research, development or consulting nature. Reply Box C289, Modern Plastics.

FOR SALE—Three used Reed Prentice, Two Plastic Injection Molding Machines. Write Box C290, Modern Plastics, New York City.

FOR SALE—One new H.P.M. 4 oz. injection molding machine; used less than 60 days, $7,500.00. Write Milton Plastics, Inc., North Avenue at McCulloh, Baltimore 17, Maryland.

PREFORMING EQUIPMENT FOR SALE

Two (2) Colton 5½T Single Stroke Tablet Machines with 3" capacity complete with 220v 3hp motors in good condition.

MACK MOLDING CO., Wayne, N. J.

FOR SALE—Ethyl Cellulose Molding Powder, Virgin Material, Approximately 20,000 lbs., Amber and Butterscotch Amber, Fifty-five cents per lb., Write Milton Plastics, Inc., North Avenue at McCulloh, Baltimore 17, Maryland.

WANTED TO BUY: Used 1 oz. injection molding press hand or hydraulic operated with thermostatically controlled heating bands. State condition, location and best price. Reply to: Post Office Box 281, Warsaw, Indiana.

COLD-MOLDING, chemist and engineer, fully experienced and conversant with processes, formulas and machinery, seeks connection in a supervisory, research or consulting capacity. Reply Box C292, Modern Plastics.

WANTED

Capable man to take full charge of Injection Molding Plant. Engineer, knowledge of product design, fabrication, small tool repair shop, plastics production preferred. A splendid opportunity for the right man. State details of previous experience, education, age, and salary expected.

ARDEE PLASTICS COMPANY, INC.
42-08 Vernon Blvd., Long Island City 1, N. Y.

WANTED—used 8 ounce injection moulding machine. Give full particulars including condition, prices, etc. Reply Box C291, Modern Plastics.

REPRESENTATIVES and Exporters wanted to distribute nationally advertised plastic control knobs. Territories open in most of the larger cities. Interested parties please reply, giving full details of your sales organization. Reply Box C293, Modern Plastics.

IDEAS FOR PLASTICS: Do you want new items that will really compete, with good models all ready for the die-maker? Or have you an idea that needs developing? Idea man, designer, model-maker, with products in every five and dime and department store will assist you on free-lance basis. Reply Box C294, Modern Plastics.

PLASTICS DESIGNER: Tool and mold. Should have experience in compression and injection molding. Excellent permanent position with large eastern manufacturer. Write in detail to Box C295, Modern Plastics.

WISH TO CHANGE JOBS. Have had seven years experience setting up and supervising injection molding machines. Can furnish references. Location secondary. Reply Box C296, Modern Plastics.

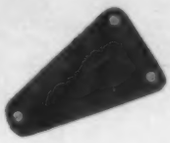
CHEMICAL ENGINEER—Plastics and Resins B.S. 1937 M. I. T. Ten years in plastic and resin field. Desires position in related fields as sales engineer, research chemist or manufacturing supervisor. Have had considerable experience in administrative, technical research and sales engineering positions in plastics, synthetic resins, molding, laminating, emulsions, coatings, rubber, adhesives and associated fields. Northeastern states preferred. Reply Box C297, Modern Plastics.

FOR SALE—2 Colton 10-35 Rotary Tablet Preforming machines, condition like new, one equipped with ½" punches and dies and the other with ¼". Molded Plastic Button Corp., 63-17 Blvd. Arverne, N. Y. Belle Harbor 5-4207.

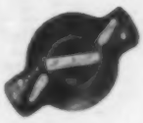
EX-ARMY MAJOR, U. of Pa. Grad., experienced salesman in custom molding field, seeks to locate with western firm. Reply Box C298, Modern Plastics.

HELP WANTED: Resin Chemist with some experience in compounding and molding of thermosetting plastics for research and development work in the field of resin applications to pulp and paper products and by-product utilization. Give full details of training and background in letter of application to The Institute of Paper Chemistry, Appleton, Wisconsin.

WANTED: Aggressive mold expediter with contacts in the larger molding companies. Tool and Die Co. with modern equipment and expert mold makers, desires to have outside man submit prints for quotation. Salary or Commission. State full qualifications. Write Box C303, Modern Plastics.



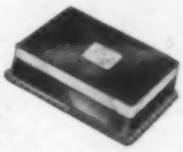
MECHANICAL strength can be added to molded parts without burdensome weight. Fastening inserts, or structural reinforcements, are light, strong; available in many cases from stock.



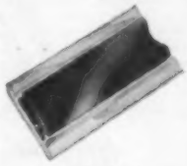
ELECTRICAL conductivity of aluminum is high. Perhaps you're thinking about a molded plastic electrical part where aluminum inserts provide the necessary conductivity. They're strong, too!



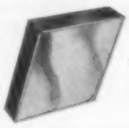
THERMAL properties of aluminum are excellent. Let's say you're designing a plastic product which must be air-cooled. You might use aluminum discs, molded in, as above.



DECORATIVE values of aluminum are a long story in themselves. Use it plain, or with frosty or mirrorlike Alumilite or colored finish (patented process). Remember, it's light!



EXTRUSIONS of plastic combined with extrusions of aluminum? Why not? One supplements the other, in beauty and strength. Alcoa Aluminum is available in many stock shapes.



LAMINATED plastics can be faced with aluminum sheet for a new idea in modern materials. Or, why not inset Alcoa Aluminum decorations in your dark laminates? Attractive!

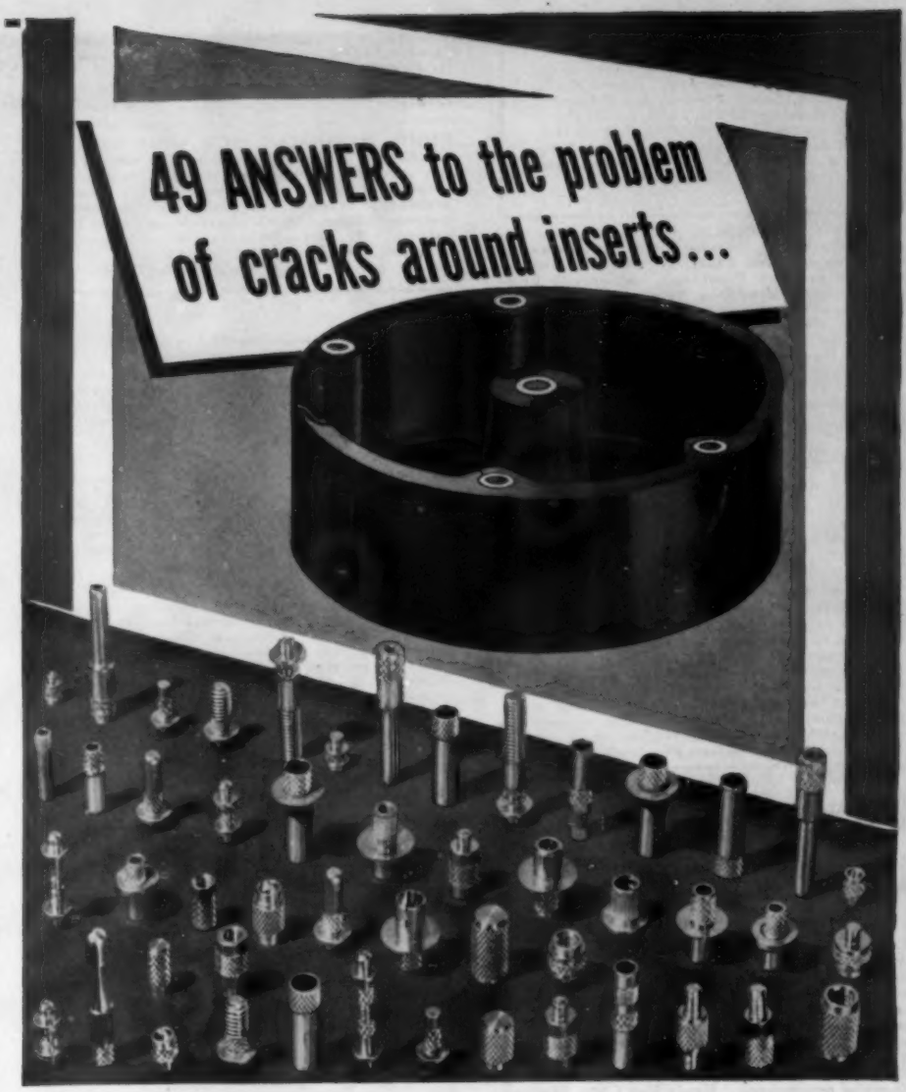


FORMED plastic sheets team up well with Alcoa Aluminum, as in this navigator's dome. The whole assembly is light, strong, easy to mount. Is there a household idea here?



CHEMICAL properties of aluminum supplement those you like to stress in plastics. Can it help you in products for textile, process, petroleum, pharmaceutical, food industries?





EVERY ONE A BARGAIN IN ALCOA ALUMINUM!

Bargain? Yes, not only does it solve problems, but the light weight of Alcoa Aluminum (one-third that of steel) gives you many *more* inserts per pound of screw machine stock. And these inserts are *friendly to plastics* . . . the inserts contract at the same rate as the plastics and, therefore, prevent stresses that may crack an expensive job.

Your insert manufacturer will find Alcoa Aluminum Alloys supplied in the stock sizes and shapes he requires for economical production. He'll find them easily machinable, too.

And you will like Alcoa Aluminum, wherever a metal is to be combined with a plastic. In light weight, in handsome appearance, and even in chemical and electrical properties, you'll find that *Aluminum-Plastic Teamwork Pays Off!*

ALUMINUM COMPANY OF AMERICA, 2175 Gulf Bldg., Pittsburgh 19, Pa. Sales offices in principal cities.

ALCOA FIRST IN **ALUMINUM**

IN EVERY COMMERCIAL FORM

FOR SALE: One 14" Barnes Lathe with 24" swing over gap. Price $500.00. Also For Sale: Packed for shipment one Schramm 240 C. F. M. A. 125 P.S.I. Air Compressor, complete with 60 H.P. Westinghouse induction motor, receiver, after cooler, switches, etc. Reply Box C299, Modern Plastics.

ENGLISH RESEARCH CHEMIST, age 32, B.S. with honor, London, A.R.I.C., seeks responsible position Plastics or Rubber Industry. At present, President, half-owner English Plastics Moulding Company. Previous plastics, synthetic and natural rubber experience in charge of research laboratory; two years United States as Technical Advisor to British Government. Requires settle in U. S. because of American wife. Reply Box C301, Modern Plastics.

SURPLUS MATERIAL FOR SALE

Acetate, Butyrate, Styrene

Wide range of colors

Reply: Box 59, Kent, Ohio

SALESMEN—fully protected territories available for representatives with established contacts in various fields for custom molding by well known New York firm. We have complete experimental development, engineering, mold making and manufacturing facilities. Straight commission basis. Furnish complete information concerning age, experience and qualifications. All replies confidential. Reply Box C302, Modern Plastics.

AVAILABLE IMMEDIATELY: 1—20 kw Westinghouse High Frequency Heating Equipment (R. F. Generator). Standard design. Power supply unit identical to that used in Dielectric Heating, Radio Broadcast, Induction Heating. Practically new equipment—used very little. For complete details write—F. V. Drake, Purchasing Agent, Columbian Rope Company, Genesee Street, Auburn, New York.

WANTED TO BUY OR LEASE: Factory with screw feed extrusion equipment for plastics or interested in buying said extrusion equipment separately. Give description of factory and specifications of the extrusion equipment regarding size, type of heating, electric power service, type of screw feed and alloy from which made. State accurate conditions of equipment. Reply Box C304, Modern Plastics.

FOR SALE

19 Units—New—Crated, Consisting of: (1) Vickers Constant Delivery Double Pump V-469-A-H Characteristics at 1200 R.P.M. Large volume pump—55 gallons at 1000 lbs. per sq. in. Small volume pump—4.7 gallons at 1000 lbs. per sq. in.

Flange mounted to: (1) Louis Allis or General Electric, 25 H.P. motor, 550 volts, 60 cycle, 3 phase, Frame 404. Speed 1200 R.P.M. at 60 cycle. For further information, write Box C305, Modern Plastics.

FOR SALE: 2—Baker Perkins Jacketed Mixers 100 gals. working capacity; HPM 500 ton Mold Presses 42" x 48"; D.&B. 500 ton 42" x 48"; Adamson 400 ton 27" x 24"; also 20 to 250 tons from 36" x 36" to 12" x 12"; Farrel 16" x 48", 2 Roll Rubber Mill; Rotary Preform Tablet Presses, 1/16", 5/16" and 5/16" diameters; 40 Ton Broaching Press; 400 Ton Extrus. Pr.; Injection Molding Machines; W. S. Hor. 4 Plgr. 1" x 2" x 4" H.&L. Pressure Pumps; HPM 1 1/4" x 6" Vert. Triplex 10 GPM 2700 lbs.; 7 Hydr. Oil Pumps, Vickers, Oilgear, Northern, etc.; Elmes 1" x 4" and 1 1/2" x 4" hor. 4 plgr. 5 to 8 GPM 4500 lbs. and 5500 lbs; Rumsey 6 1/2" x 8" vert. triplex, 65 GPM 900 lbs.; Elmes 2 1/2" x 4" hor. 2 plgr., 17 GPM 850 lbs.; 10 HP horiz. 1 1/2" x 4" triplex 6 GPM 3000 lbs.; New Vickers 1 1/4" Oil Relief Valves; New Vickers 1/4" Flow Control Valves; Hydr. Steam Pumps; Low Pressure Pumps 150 to 600 lbs.; Hydr. Accum.; Heavy Duty Mixers; Grinders, Pulverisers, Gas Boilers, etc. PARTIAL LISTING. WE BUY YOUR USED MACHINERY. STEIN EQUIPMENT CO., 436 Broome St., NEW YORK 13, N. Y. CANAL 6-8147.

WANTED: Reed-Prentice 8 oz. Injection Presses. Machines must be in excellent operating condition. Advise in detail date of purchase, location, etc. Reply Box C300, Modern Plastics.

RIGHT HAND MAN TO A BUSY EXECUTIVE. If you've a load on your shoulders, my capabilities can free you for your most important tasks. Experience with injection molding, fabricating, handling personnel, correspondence, stock control, can read blue prints. College background, 33, single, veteran. Highly receptive to any bright future. Reply Box C306, Modern Plastics.

INDIA—Manufacturers of Plastic Sheetings for all purposes, Molders and Chemical Machinery, etc., desiring representation in India please contact by Air Mail with samples: Kalamazoo Corporation, 40 Cavasji Patel Street, Fort, Bombay.

LOS ANGELES Plastic Factory For Sale. Going concern, proprietary molded products sold internationally, desirable location, excellent lease. Bargain. $75,000 cash required Write Box C307, Modern Plastics.

FOR SALE: Two injection molding machines Reed-Prentice 8 ounce Model 10-D-8-RP and Lester Phoenix 12 ounce Model 3-S-27-12. Both machines approximately one year old and in perfect condition. Approximately 10,000 pounds virgin molding powder in various colors at a saving. Also, regrind. For price information write Box C308, Modern Plastics.

PLANT SUPERINTENDENT WANTED

With experience in electrical wire manufacturing. Must be well versed in all phases of production, including technical knowledge of thermoplastic extrusion and compounding. Should be a basic wire man who has occupied a similar position elsewhere.

Will consider general manager who has proper factory experience. Plant located outside Metropolitan Area New York City. Salary commensurate with position. Write Box C309, Modern Plastics.

MANUFACTURERS REPRESENTATIVE with office on Fifth Avenue at Forty-Second Street, wants lines for all classes of trade. Some warehouse and re-shipping facilities available. Caraday Sales Co., 489 Fifth Ave.—New York 17, N. Y. Phone—MUrray Hill 2-8777.

WANTED

200 Ton—300 Ton F. J. Stokes

Toggle Presses

Reply Box C310, Modern Plastics

WANTED By Mfgr: A man experienced in extrusion and compression molding. Located in Phila., Pa., area. Reply Box C311, Modern Plastics.

PLASTICS ENGINEER: 5 years experience; degree Chemistry; post-graduate work Plastics; knowledge properties, test methods, applications, standardization, specification writing, and research on all types plastic materials. Skilled in technical and industrial writing. Seeks position Development, production, technical sales or sales promotion. Preferred area—Metropolitan N. Y. or New Jersey. Reply Box C312, Modern Plastics.

ARE YOU CONTEMPLATING entering the Vinyl Film field or are you already in it and seeking a man with practical experience in compounding, mixing, calendering, slitting and printing of Vinyl Film. Am anxious to locate with responsible Principals. Reply Box C317, Modern Plastics.

REPRESENTATIVES WANTED by custom plastics fabricator. Straight commission basis. Would prefer men now handling injection or compression lines. Reply Box C261, Modern Plastics.

FOR SALE: Hele-Shaw Pump, 3000 lbs. P.S.I., 20 G.P.M. Model J-H-P3. Used 1 month. Adv. Novelty Mfg. Co. Inc., 2218 N. Park Ave., Phila., 32, Pa. Fremont 7-4395.

FOR SALE—Catalin Rod—2", 1 3/4", 1 1/2", 1 1/8", 3/4" Crystal, Black, Shell. Reply Box C314, Modern Plastics.

WANT Plastic Plant Superintendent of exceptional ability to manage compression molding plant of approximately 200 employes. Must know Thermo setting material compounding, Electronic operations; equipment such as accumulators, presses, mills, hydraulics; steam, air, water lines, etc. Must be able to build organization in plant, have ability to get things done, and excel in production. Nothing to do with sales. Excellent future for right man in fast growing organization in Middle-West. Give full particulars, past experience in this line of work, and where employed at present. State salary expected. All information confidential. Our own organization has been advised of this ad. Reply Box C313, Modern Plastics.

GRADUATE of Plastics Technical School, with twelve years business experience in varied lines of manufacturing, several years industrial purchasing in compression plant, plastics extrusion and injection concern; efficient, conscientious, systems man with original ideas, desires start in production planning, finishing or sales engineering department of busy plastics manufacturer. Reply Box C315, Modern Plastics.

EXPERIENCED SALES ENGINEER For Established N. Y. Plastic Extrusion house. Man must have background in the field. Write, stating full qualifications, references, etc. Reply Box C316, Modern Plastics.

ONE TON crystal clear cellulose nitrate scrap .070 gauge. Perforated strips averaging 3" x 20". Exceptionally clean and packed in 40 lb. wood cases for immediate delivery. Florida Supply House, Bradenton, Florida.

MICARTA—2300 lbs. of 1/8", 1/4" and 1" Micarta Sheet. Canvas base. Lowest prices. Immediate delivery from stock. Full sheets only, no cutting. MiCluf Plastic Co., 617—18th St., Denver, Colorado.

FOR SALE

25 Ton "C" Frame Type High Speed Self Contained Hyd. Press.—300 ton New Hobbing Press with Pump—Racine Pumps, Boosters, Valves, Logan Pumps, Valves.—250 Ton Farquhar Straightening Press, Bed 32" Wide, 22' Long. Self Contained.—200 H.P. 75 Gal. 3000# Pump 200 H.P. 200 Gal. 1500# Pump. 18" x 15' Accumulator 1500#.—15" x 11' Acc. 400-2000#. 6" x 9' Accumulator-2000#. 300 Ton Press 20" Ram, 8' Stroke, 24" x 20" Platen. 500 Ton—1000 Ton Hobbing Press.—Hele Shaw Variable Pressure 33 GPM 2500#.—Vickers Oil Pumps 17 GPM 500 to 1000#. Elmes Horo. 4 Plunger 6 1/2 Gals. 5000#.—Stillman 12 x 12" Laboratory Presses. Hydro Pneumatic Accumulator, 42" Air Cyl. 48" Stroke. Aaron Machinery Co., 45 Crosby St., NYC.

VENEZUELAN PLASTIC MANUFACTURER with thermosetting cosmetic molds perfect condition but with little market in Venezuela interested making exchange with dinner set molds at rate two for one. Reply Bayobeck Apartado 447, Caracas.

FOR SALE

30—Stokes, Colton Preformed Presses, Models F, T, R, D, DDS2, from 1/4" to 4"; 5—Baker Perkins Double Arm Jacketed Mixers; 1—Vickers Pump 20 GPM, 1000-lb., motor driven. BRILL EQUIPMENT COMPANY, 225 West 34 Street, New York 1, N. Y.



Sandee CELLULOSE ACETATE BUTYRATE *Extrusions*

THIS general purpose material, under the trade name TENITE II, has attained an excellent reputation for appearance and serviceability in widely diversified fields. This is not only true in injection molded and fabricated items but is equally true in Extruded Rods, Tubes, and simple and complicated shapes. Colorful, tough, easily machined and easily formed to fit specific contours, it is serving to complete satisfaction in fields ranging from rods and tubes for toys to furniture and refrigerator trim.

Study the properties of this excellent general purpose material, then check with *Sandee* for confirmation of suitability to your requirements. *Sandee's* practical know-how in extrusion often helps in altering designs for improvements in functional utility, appearance, and cost.

CONSIDER THESE PROPERTIES OF
SANDEE
CELLULOSE ACETATE BUTYRATE

1. Specific Gravity	—1.22
2. Tensile Strength	—3000 to 5000 p.s.i.
3. Impact Resistance	—Excellent at normal temperatures
4. Heat distortion	—170° to 185°F.
5. Rigidity	—Good to very good
6. Dimensional Stability	—Good to very good
7. Water Absorption	—1 to 2%
8. Burning Rate	—Slow
9. Odor	—Nil to faint
10. Color	—Unlimited
11. Finish	—Excellent
12. Machinability	—Excellent

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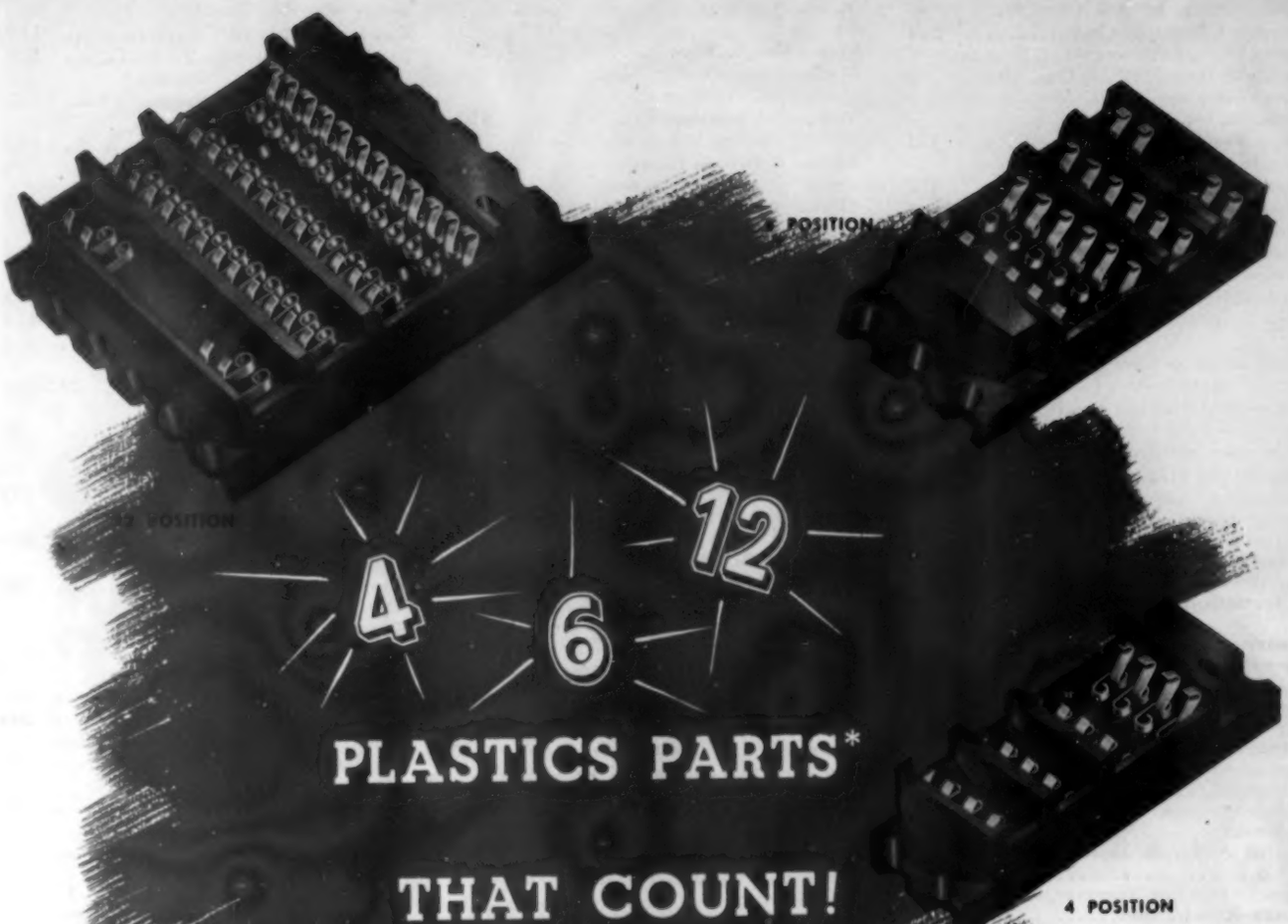
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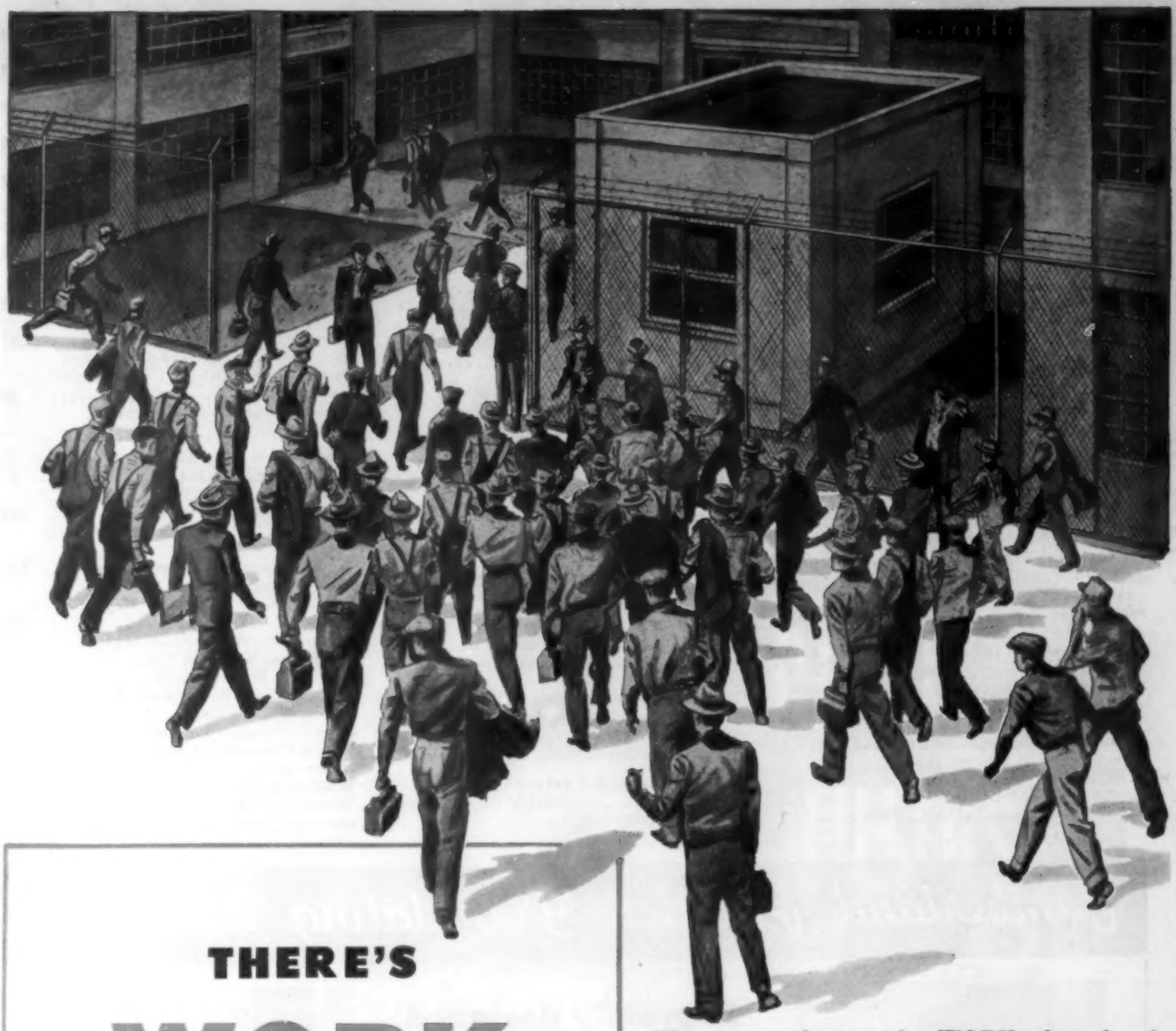
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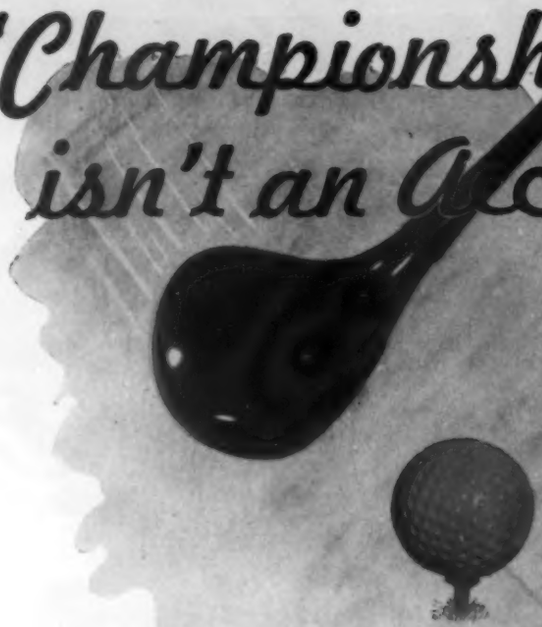
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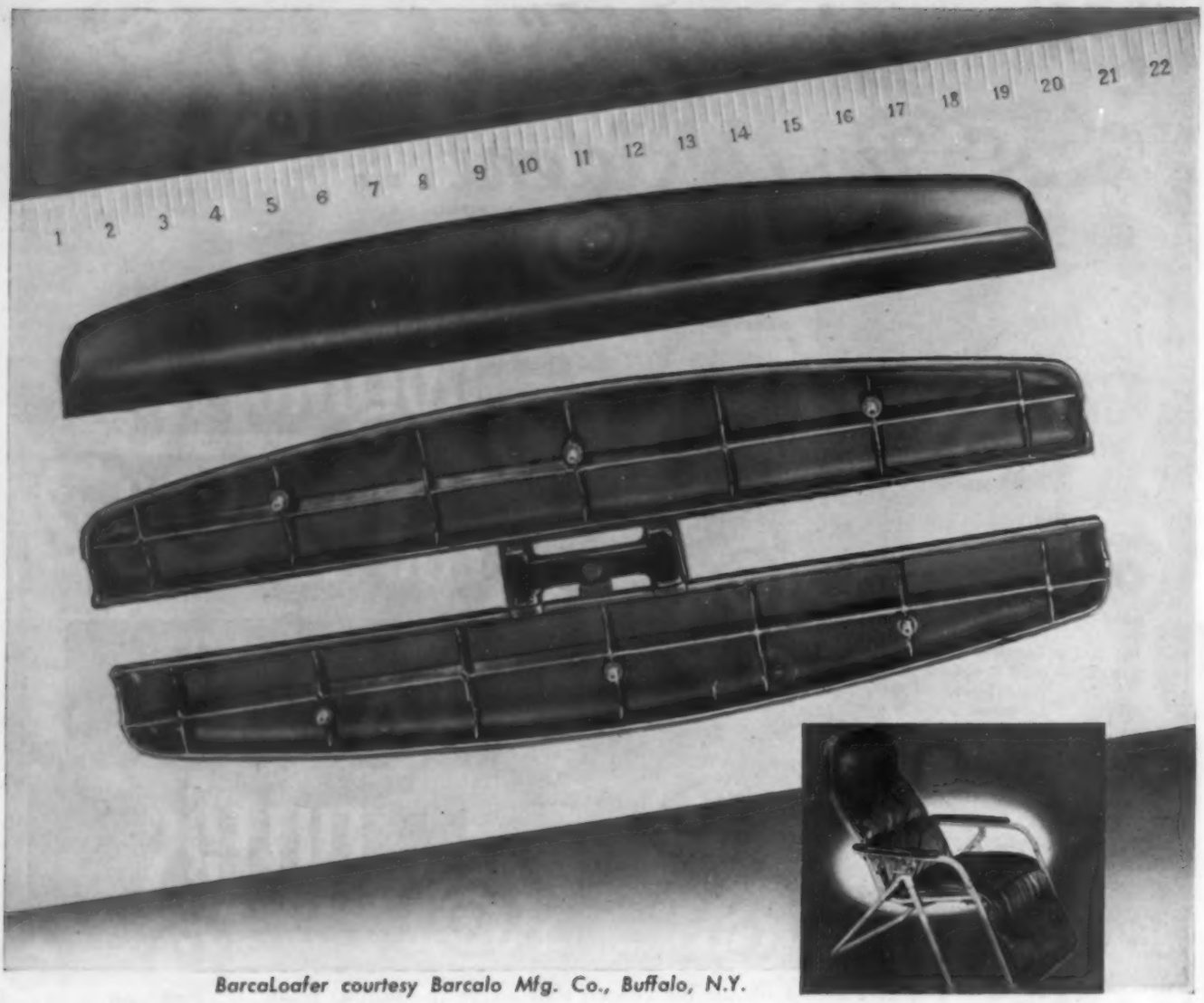
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